# I/O News

First Anniversary Issue!

THE OFFICIAL PUBLICATION OF THE INTERNATIONAL ASSOCIATION OF CROMEMCO USERS

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## System One Introduced at WESCON

The long-awaited and much-heralded Cromemco System One made its public debut at the September WESCON event in San Francisco. Preliminary reactions indicate that the System One will exceed expectations.

The S-100 bus computer has a newly designed, 8-card backplane trademarked the "Blitz Bus." In its standard configuration, the System One comes equipped with two 5¼" quad density floppy disk drives, and the proven ZPU, 64kz, 16FDC, and PRI boards. These are accommodated in an attractive steel and aluminum cabinet which measures just 7 inches high, by 14.2 inches wide, by 16 inches deep.

The System One was designed for the office environment, offering System Two capabilities in a pleasing desk top package. Its price (list: $3,995) is the lowest of the expandable systems in Cromemco's broad line of computers. Rack mounts are available for standard 19" racks.

While not as expandable as the Systems Two and Three, there are sufficient card slots to support CROMIX with up to three users with a full, 64k of memory per user. More users can utilize the System One under the newest version of CROMIX which allows memory sharing.

All of Cromemco's wide range of languages and applications software can be used on the System One, including the new "Master Series" software. It is worth noting that a color graphics sub-system can be added, either under CDOS or CROMIX configurations.

Hard disk capability is also available in the System One. The System

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Picture shows the new, System One with the 3715 Printer and the 3102 Intelligent Terminal.
PHOTO COURTESY OF CROMEMCO, INC.

***Structural Analysis Program For Small or Large Computer Systems***

## SAP-80

By Carl B. Hansen, P.E.

The article on the AMS micro STRESS program in the January/February issue of I/O News is very interesting but those who are interested in such a program should also get acquainted with the new and very powerful SAP-80 program available for micro computers.

We, at the Civil/Structural Engineering firm of Ewell W. Finley, P.C., New York, first learned of this program and met the developer, Edward L. Wilson, Professor of Civil Engineering, University of California, Berkeley, at a New York seminar on EASE 2, a structural analysis pro-

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## CPMSIM A CP/M Operating System Simulator

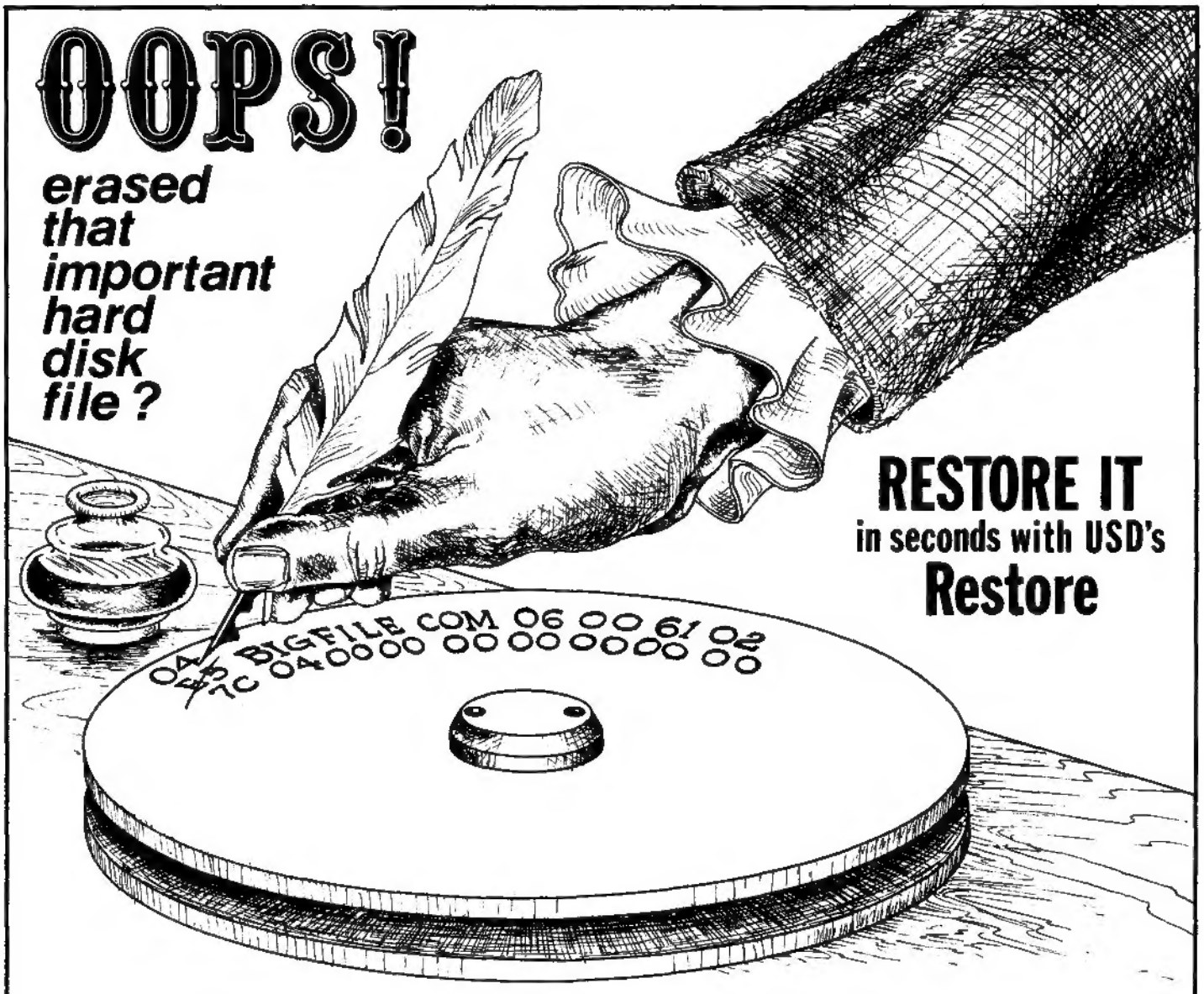
By George Cowsar

Probably nobody knows exactly how many applications programs have been written to run under the CP/M Operating System, but there are quite a few. There are BASIC interpreters, and compilers, there are FORTRAN and COBOL compilers and runtime systems, there are General Ledger packages, Accounts Receivable, Accounts Payable, Payroll, Inventory, Job Costing, Word Processing, Data Base Management, Land Surveying, Medical and Dental Billing, Project and Time Management, Professional Time Billing, Securities and Bond Brokerage Ledgers, and on and on and on...

Continued on page 21

# OOPS!

***erased that important hard disk file?***

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September/October 1981 Volume II, Number One

**I/O News** The Official Publication of The International Association of Cromemco Users is available through membership in the association. Editorial and advertising policies are designed for the enlightenment of the members in regard to new uses for, and developments of, Cromemco products and other products compatible with Cromemco systems.

## ARTICLES & FEATURES



## DEPARTMENTS



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Richard Kaye
Editor and Publisher

# tec·tips

TEC TIPS is a regular column aimed at providing hints for keeping systems up and running. It will not attempt to deal with specific engineering applications or non-standard configurations. TEC TIPS is edited by Richard Quinn, owner of QUINTEC, a Southern California Computer service firm.

### SHORTED TANTALYN CAPACITORS

On all cards there are small 6 to 10 microfarad tantalyn capacitors located close to the voltage regulator heat sinks. Occasionally, these capacitors short and either splatter themselves on adjacent components or cause a malfunctioning of the voltage regulators. This is especially true in systems where these components run hot as in the 64KZ's memory card. If your system experiences an occasional loss of the +18 volt fuse, check these capacitors on all cards for leakage or shorts. There is one capacitor on the bus side of the regulator as well as one on the regulated side. They can be identified by their small silver tubular shapes. If one is discovered that has splattered a metallic-looking substance, or is leaking an oily substance, it should be replaced with tantalyns of like value. We have experienced situations where these tantalyns have blown and the circuit card continued to operate. This however causes the card to be particularly sensitive to power fluctuations and glitches. A careful visual examination is often all that is needed to determine whether or not the capacitor has "popped."

### KEYBOARD CONNECTION DIRECTLY TO TU-ART

Dr. Franz Bruin from the American University of Beirut asks, "How should one connect a conventional QUERTY keyboard to a parallel input of a TU-ART board?"

While I do not know exactly what your intent is, I will pass on some tips that were provided from Cromemco.

Most standard ASCII keyboards handle the necessary eight data plus strobe information. The keyboard encoder chips for most keyboards provide the necessary short duration strobe pulse that a TU-ART requires. Depending on whether or not your system is to be handled via polling software or interrupt generation, this strobe line should be tied to the SENS line, pin 15 of the J2 or J3 connector, or the INPUT STROBE line, pin 2 of J2 or J3. If your software is interrupt driven, use the SENS line. Otherwise, in a polling situation, the INPUT STROBE line should be sufficient.

The TU-ART will then need to be initialized via the software per the instructions in the TU-ART manual. The hardware interface should be fairly simple and straightforward. If the logic of the keyboard is reversed from that required by the TU-ART, using some simple TTL inverters such as 74LS04's should solve the problem. Your primary difficulty will be that of software. Software requirements will depend entirely on what you intend to do with the keyboard information and whether or not it is polled or interrupt driven. Furthermore, I am not certain how you intend to handle computer output. I am assuming that display would be accomplished through the use of an S-100 bus video interface board. As Cromemco does not manufacture any such board, you will be on your own to adapt the necessary hardware from other sources.

It is my opinion that for use as a standard terminal, this approach may be as expensive hardware-wise as some of the lower-priced stand-alone terminals. Unless you have a dedicated application in mind, I would advise the use of a standard RS232 terminal. Good luck!

### PERSCI 299 HEAD DAMAGE

If you have experienced a disk jam on the automatic eject system on the PerSci 8" drive, be careful when removing the disk. It is advisable to use the services of a qualified technician where possible. The jammed disk has a tendency to pull the floating head loose from its mount. The floating head is attached to a very thin piece of metal and acts as both the second head and pressure pad for holding the disk against the first head. Because of its single head construction, this problem did not occur on the earlier 277, single-sided drives. If a disk jams, do not force its removal. Power down the system, carefully remove the drive from the computer, and examine the reasons for the jam. More than likely it is because the eject cams have slipped on the eject motor driveshaft. These cams can be loosened with a small Allen wrench and manually rotated to release the disk. Following this procedure will save damage and alignment problems on this second head.

If you suspect damage to the second head, you can use the RDOS Diagnostics contained within the 16FDC controller, specifically the side select command (SC 0 or 1). You will need to use a diskette initialized for double-sided operation. A damaged second head is characterized by read or seek errors when that head is selected. (Note that the floating head is head 0 on the left-hand side of the drive and head 1 on the right-hand side of the drive). In addition, a careful visual examination will reveal whether or not the head has been pulled loose from its mounts. Loosening or removal of the heads requires repair and realignment using alignment diskettes.

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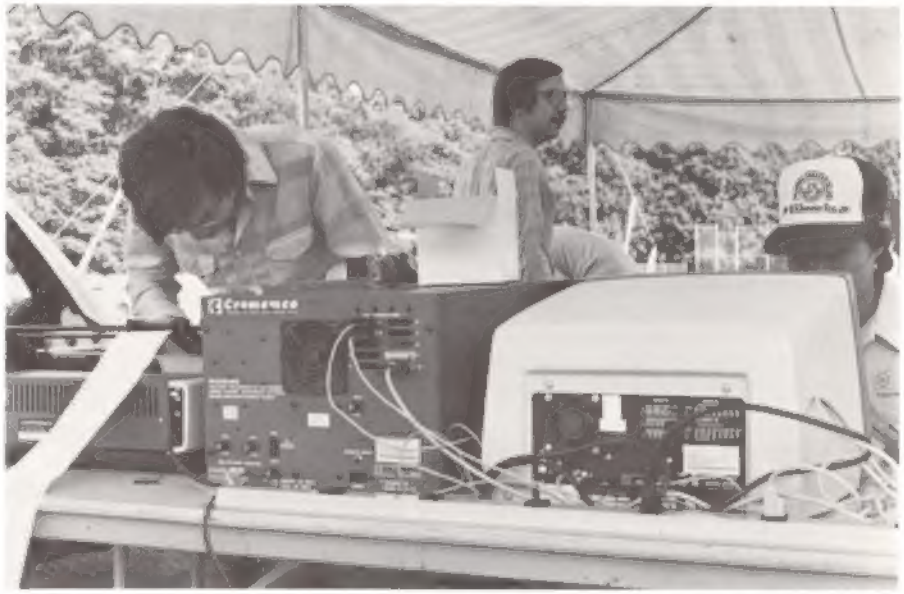
# "Fast Finish": Data Processing Results On-Site At A Footrace

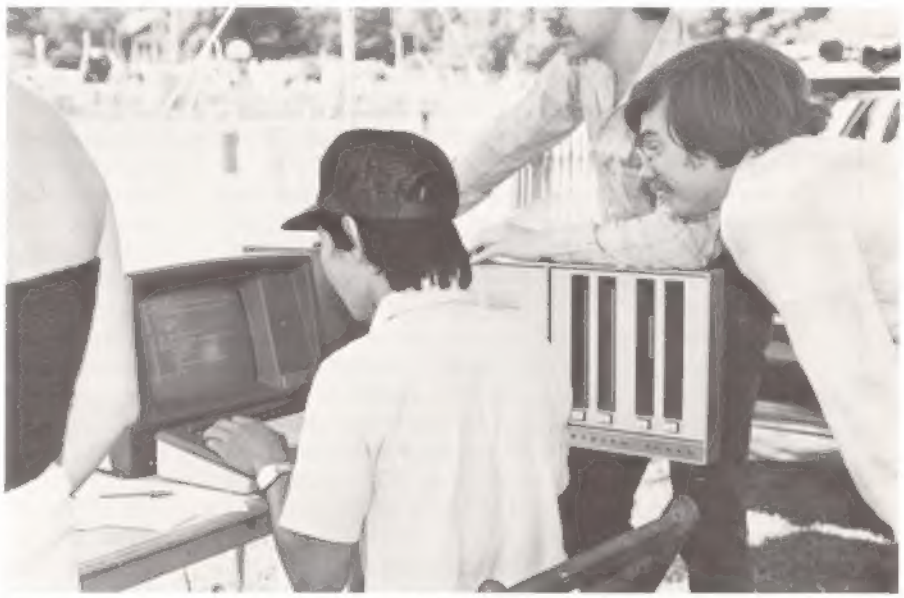
When the list of registrants for the Annual Shelter Island (NY) 10 Kilometer Run reached the 1,000 mark, race organizer Cliff Clark knew it was time to call in a microcomputer specialist to process the results. "In a footrace involving hundreds of dedicated runners, it's not just win, place, and show you have to record," said Clark. "Most of the runners do not expect to finish at or near the top. Not because they don't take running seriously — the opposite is true. They've trained hard for it so they're out to test their skill and stamina against the best and also against their peers. For this reason we establish 18 classes of runners: males under 20 years, female under 20 years, males 20-29, females 20-29, and so forth. I knew it would enhance the satisfaction the runners seek to see how well they do in each class as well as against the entire field, and to get the results as soon as possible after the race was completed."

Clark called upon Greg Galdi of the Custom Computer Specialists system house in nearby Riverhead and outlined his idea for computerizing the race results on the race course site. Since the footrace was organized as a charity for the county Special Olympics, Galdi offered his services as a courtesy. Designing software to match, sort, and print finish times of the runners would be relatively routine. "What intrigued me," said Galdi, "was the logistical challenge — setting up a micro system at the outdoor site and processing the finish line data on-the-spot. Bringing the computer to the job, so to speak."

During the week prior to the race, Galdi and his staff entered the name, code number, address,

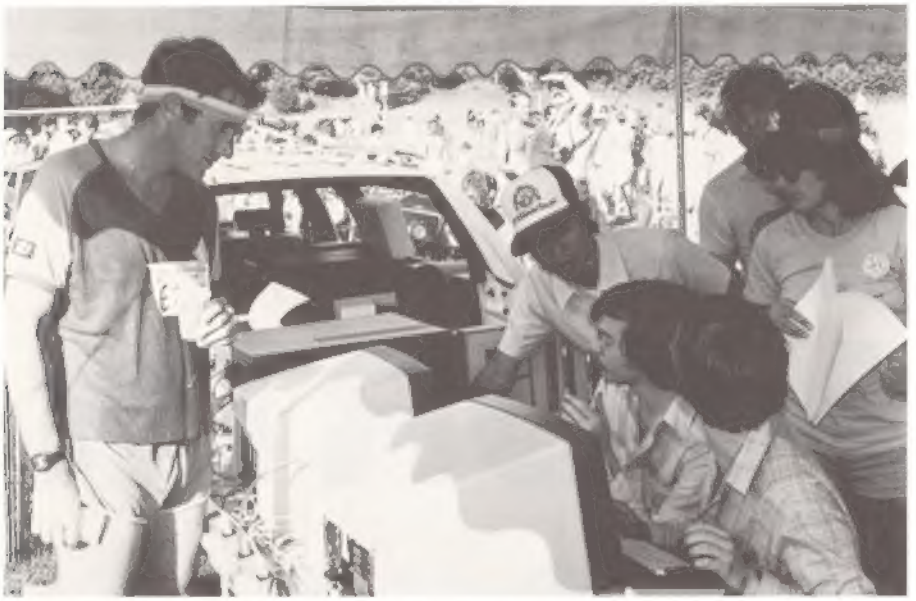


A systems house staff set up a Cromemco System Three, two terminals, and a high speed printer under a field tent to provide on-site processing of footrace results.



Programmer Al Chang checks out "Fast Finish," his custom designed program for sorting the finish positions of 1109 runners in 18 different classes. Running the program under CROMIX permitted program modifications concurrent with data acquisition.


Within an hour after the race ended, the finish line computer system printed out complete results, showing official times and positions of the 1109 runners. The next day individual results were mailed on a postcard to each participant.



A runner inquires about his personal results at the computer station just a few feet from the finish line. The print-out showed the runner's time, position, and average pace per mile of the 10 kilometer footrace.

and class of each runner into a 250K file in a Cromemco System Three. On the day of the race they loaded the dual-drive Cromemco, two terminals, and a high speed printer into the back of a station wagon and hauled them to the race site, a high school athletic field. They set up under a tent near the finish line. As each runner came in, his official time and code (jersey) number were manually posted on a prepared form. From this form the data was entered into the computer. The program for matching and sorting was custom designed by CCS programmer Al Chang. Called "Fast Finish," it is written in 32K Structured BASIC. The program and the runner files were stored on an 8" diskette. Using the CROMIX operating system, Galdi and Chang were able to make adjustments to the program while at the same time inputting finish line data. "This was important," said Galdi, "because the athletic event was somewhat new to us and as such an unpredictable data source. We were modifying the program to suit our needs as the race was going on." Within an hour of the race's completion, a list of the first hundred finishers was printed out. For each runner the list showed name and number, overall finish position, official time, position in his/her particular class, and average rate of speed per mile. For example: Herb Kahl finished 42nd overall with a time for the 10 kilometers of 34.47.0. He was 6th in the class of men between the ages of 30 and 39 and 40th among all men. His average pace per mile was 5.610 minutes.

In the week which followed the race, Galdi's systems house designed a postcard printout which was mailed to each of the 1,109 footrace participants. It was printed on a Cromemco dot-matrix printer at the rate of 180 characters per second. In addition to showing the runners' personal results, the postcard displayed a message of "Congratulations [name] on your finish in the 2nd Annual Shelter Island Run for Special Olympics."

**See Print-Out on next page.**

According to Cliff Clark, the work of the finish line computer added an extra dimension to the success of the race. "The nature of a multi-participant sport is in each participant measuring his effort in reference to all the others. The micro gave each runner a complete record of his performance. Next year we'd like to expand the software to compare a runner's year-to-year results. I see a time in the future when, through the microcomputer's capability, footracing will have the same kind of statistical base other sports such as baseball have. This will increase interest in the sport and help all runners improve their skills."

As far as Greg Galdi is concerned, the challenge of operating a "portable" microcomputer system has been met. "Our equipment performed as well in the open air as back in the shop. We were careful

## "Fast Finish"

POSTCARD PRINT-OUT OF PERSONAL RACE RESULTS
(Winner)

The 2nd Annual Shelter Island Run

Statistics Courtesy Custom Computer Specialists, Inc.
Riverhead, N. Y.

Congratulations Bruce Bickford on your recent
finish in the 2nd Annual Shelter Island Run

You finished:

1 overall with an lapsed time of 28 58.6
1 among Males in your age group
1 among all Males

Your average pace was 4.672 minutes per mile

We look forward to seeing you on the same weekend in 1982

C 1

to keep it shaded from the hot sun, and we brought along plenty of cable to assure uninterrupted power from a remote source off the field. With preparations that take the special circumstances into account, I believe the compact microcomputer proves to be practical and effective for on-site applications."

# A Spooling Program For 32K Structured BASIC

By J. Siedband

Since the advent of CROMIX, those of us with large bodies of programs in BASIC have sought some way to access the spooler in order to avoid printer conflicts. The program listed is an attempt to resolve those conflicts by making the proper CROMIX calls from within BASIC. This requires at least one extra bank of memory in addition to the bank in which BASIC resides. The program itself really begins on line 300.

```
 10 Rem  "SPOOLTES. LIS" this routine should test the CROMIX spooler
 20 Rem  In order for this to work, there must be at least one
 30 Rem  extra bank in memory —— do not use on a single user
 40 Rem  system with only two boards!!!!!
 50 Rem  ********************************************************
 60 Dim Z$(70),Filename$(15),Spool$(9),Spool0$(2),Spool1$(2),Spool2$(24)
 70 Integer Spool(5) : Rem List of Addresses to pass parameters
 80 Rem  ********************************************************
 90 Rem  LD      BC,00
100 Rem  POP     DE          ;recover address of parameter list
110 Rem  PUSH    HL          ;save return address to BASIC
120 Rem  JSYS    . FSHELL    ;fork a shell process
130 Rem  EX      HL,DE       ;put PID in DE to return, if desired
140 Rem  POP     HL          ;recover return address
150 Rem  JP      (HL)        ;return to BASIC
160 Rem  ********************************************************
170 Data 1,0,0,%00D1%,%00E5%,%00CF%,%0048%,%00EB%,%00E1%,%00E9%
180   For I=0 To 9
190   Read S : Spool$(I)=Chr$(S)
200   Next I
210 Rem  Use CROMIX clock to get unique filename in next line
220 Mat Spool=0 : Filename$=Time$(" ")
230 @"Storage File Name = = = =>  ";Filename$
240 Spool0$="sh"+Chr$(0)
250 Spool1$="-c"+Chr$(0)
260 Spool2$="spool -d "+Filename$+"&"+Chr$(0)
270 Spool(0)=Adr(Spool0$)
280 Spool(1)=Adr(Spool1$)
290 Spool(2)=Adr(Spool2$)
300 Create Filename$
310 Open\1\Filename$
320 @
330 @\1\"No.    Sq     Sq. rt.     Cube Rt.     4th Root     5th Root"
340   For I=1 To 50
350   @\1\Using"##  ####  #. ##########  ",I,I*I,Sqr(I);
360   @\1\Using" #.##########",I**(1/3.0),I**0.25,I**0.2
370   Next I
380 Close\1\ : Rem Be sure to close file before sending to spooler
390 @"File loaded,  now send to spooler!!!"
400 C=Usr(Adr(Spool$),Adr(Spool(0)))
410 @"File sent to spooler"
```

**About the Author**

Jordan Siedband, Professor of Physics at Harper College, Palatine, IL, has been a CROMEMCO user since 1977. His consulting began in 1970, mostly on table-top programmable calculators/computers, where he learned the important lesson "think small." Since then, he has worked on larger systems, which was the major factor in choosing CROMEMCO in the first place. His engineering background has been eminently successful in solving scientific as well as business problems.

# Extending Your Control Over Applications Software

By Vicki Denson

Congratulations, computer owner! You are a forerunner in a growing band of entrepreneurs who recognize the edge a microcomputer system can give your business. By organizing your financial, marketing, and production information into an efficient, rapidly accessible form, your computer system releases you and your staff for tasks more directly related to improving profits, including exploring new markets, providing better service to current customers, and developing new sales techniques.

As your business has expanded and developed, you may have wished you could tap a greater range of usable information from the data in your files; or perhaps there are changes to be made in the manner you presently keep records. Additional categories of deductions may have to be made from payroll checks. Increasing sales make it necessary to use different invoice formats for a variety of transactions. Credit terms are no longer "standard" but depend on the status of new accounts. As your business branches out to include service work, it becomes essential to know if you have serviced a particular unit before and the work that was done. You are asked to increase credit for a customer. How much have they purchased from you in the past, and have they paid promptly? Based on previous sales, to whom should you gear your new advertising campaign, and which products should you stress?

Several years ago, during the development of a payroll program, a common problem arose. After a substantial amount of coding had been done on the program, it was discovered that additional, unexpected information needed to be maintained and processed. Of course, that meant reworking the coding that had been done to that point, adding both to the cost and the time invested. It is not unusual for such an event to occur not only once, but several times for each program being written. The idea began to germinate for the creation of a system which would "expect the unexpected" — and eliminate the need to rework the software for commonly encountered changes, such as redesigning or creating new reports.

Until then, two options had been available to the businessman who found that he needed software changes as his business needs evolved. If he had enough exposure to programming to understand the concepts underlying the flow of his programs, he might opt to make minor changes himself. It has been common with older software packages to give the user the source code, with the implication that he will be able to make changes in the program. But the accompanying manual contains warnings not to alter file structures, in order to preserve the integrity of the system. The problem is that a substantial proportion of post-installation modifications which need to be made involve the files, and every program and routine which uses those files must also be changed. Quite honestly, few users have the skills necessary for major modifications and fewer still can afford the time required away from company operations to write them.

The alternative has been custom programming, a costly choice with additional problems which arise when two individuals from different fields (and using different jargon) attempt to define the problem, the input, and the expected results. Each has his separate vision of the final product, and the odds are that they're just not the same. It's possible to inadvertently omit minor details in the job specifications which have far-reaching and undesirable effects.

A great drawback to custom programming is the time lost between the moment you first recognize your new programming need, and the hour the programmer hands you the finished product. The market waits for no man, including programmers, and important opportunities may be missed because the information you need is not accessible when you need it. And custom programming still leaves the problem encountered when file contents must be changed—revising every program in which the file is used. Not only is this a time-consuming, expensive approach, but when the likelihood of introducing new "glitches" into the programs is considered, we begin to wonder if any modifications can truly be called "minor."

When the problems accompanying existing programming concepts were examined, it became apparent that it was time for a new view of applications software. Typically, a computer system is sold with pre-packaged utility software, which we shall envision as the roots of a tree. A user interacts with the system at leaf-level, the point at which he types certain information in and expects other information out. Between those two levels are the trunk and limbs, the realm of applications programming. Obviously, it is costly and inefficient to reconstruct programs from the ground up for each separate application desired, especially if certain functions are used from program to program. That is indeed

the case, and file management was the product of that insight.

File management is a software package which builds upon the utility software and raises the level at which customization takes place. Because it forms the trunk and branches of our system tree, a user who understands a few broad programming concepts required for an application can implement changes without needing to learn the technical minutiae of a programming language.

Every applications program involves the use of files. A file cannot exist until data is entered into it, so we need a mechanism (a program) for entering information. That program must also let us perform other important operations. We need to be able to include new information not previously needed in the file, to modify the contents of file records, to print out the information and arrange it into different sequences.

During the creation of a program permitting those functions, an idea began to evolve. If a file discipline could be developed, so that every file created would follow a well-defined, consistently formatted construction, then parameters or variables could be used to describe that format. At run time, the current values of those parameters are passed into the program. Thus, when a program is executed, it is not rigidly controlled by an unstructured, non-pliable file, but by variables which describe what each file currently "looks like," no matter what changes have been made since the previous run. File management operates on this basis.

Jepsan's File management system is highly adaptable to situations in which large numbers of records need to be kept and regularly updated. In a pharmacy setting, for example, where it is necessary to keep a log of customers and their medication purchases, File management might be used to set up a file containing such information as customer name and number, address, phone number, insurance data, Medicare/Medicaid status, physicians' names and phone numbers, and other relatively static information.

A second file, the prescription file, would be created, also with file management, containing customer number or name, prescription number, drug name and quantity, narcotic codes, name of prescribing physician, date of purchase, number of refills, and so on.

For each new customer, the operator would select a record entry command, and the file management program would prompt him, one item at a time, to supply the specific data for each type of information in the customer file. He would perform a similar action for each prescription, except he would be working on the prescription file.

Once records have been entered it is very easy to amend information by entering the customer number, customer name, prescription number, or whatever other referencing ID is chosen. File management displays the corresponding record on the screen; the user enters the line number of the item he wishes to change and then types the information as he wishes it to appear. If a prescription fails to achieve its desired effects, and the pharmacist finds it necessary to remove a customer from his file, it is easily managed by making a "Delete Record" selection.

File management also enables a user to add new fields of information to a file, to format and generate his own reports from a file, to place limits on the range of records to be included on those reports, to create letter formats from information in a file, and to select the fields by which records will be sorted and ordered.

Returning to our pharmacy example, while record entry is made on the basis of a particular referencing ID, (i.e., customer number), the reports generated are not limited to being sorted only by that item. It may be necessary at intervals to prepare and submit to the FDA a report of the sales of restricted drugs such as narcotics and sleeping pills. After establishing the prescription file as the source of the desired information, the pharmacist would "tell" the program that he wants to print only records with a particular narcotic code and that he wants them to appear on the report in order of drug name. Perhaps this is a report prepared at quarterly intervals. He would also indicate that he wanted to print records purchased after a certain date. If he does not need all the information contained in a prescription record for his report, he might specify that he also wants only the drug quantity, number of refills, and the prescribing physician.

If the report format he just completed is to be used next quarter and thereafter, he can retain the instructions for future use. In the relatively forseeable event that the government later requires other information such as the name of the purchaser, the pharmacist would simply repeat the process, this time indicating one more item to be printed. The flexibility and latitude of choice File management gives the user can, of course, be accomplished by custom programming; but it would be accompanied by programming fees that might induce the pharmacist to have one of his assistants go through his files manually and just ink in the extra information on the report — an adequate approach, but certainly inefficient and contrary to the reason he bought his computer in the first place.

Our fictitious pharmacy is only a representation of one setting in which file management would be ideal. Other applications are limited only by the imagination of the user. At Jepsan, where we do a nationwide business in disk drive repairs, file management is used to maintain records of repair histories by serial number. We also maintain sales-tracking files, sales-prospect files, and payroll records, and are considering instituting an inventory-tracking file. Our clients using File management cover a broad range including a dairy, school system, accounting firms, concrete products manufacturer, architectural firm, manufacturer's representative, and a property management firm.

None of the actions described thus far requires a mastery of a programming language. If the user desires reports which each contain data from a number of files, he will still need the services of a programmer. However, the task of establishing specifications, formats, and other criteria will be much less cumbersome because the user and programmer will have a common vocabulary to use and a highly structured system of files with which to work.

A comprehensive understanding of the details of the

file structures and field parameters is not necessary for effective use of File management. However, as with any other kind of knowledge, the more one knows about file management, the more powerful a tool it can become.

Jepsan, Group K's file management system uses a header record for each data file. The header record contains information about the file: number of records, number of "deleted" records, number of bytes per record, number of Type 1 fields, Type 2 fields, Type 3 fields, and Type 4 fields. These field types indicate whether the field is (1) alphanumeric, (2) an integer between −32768 and +32767, (3) a decimal number with no more than 6 significant digits, or, (4) a decimal number with no more than 14 significant digits. As records are added, fields are added, records are deleted, and so on, the header record parameters are changed accordingly.

The actual fields are described in a master file. An example of the master file (PROSPECT.MST) for a data file named PROSPECT.DAT is given in Figure 1.

```
 1   25   1    1    0    PROSPECT - MASTER FILE
 1                  1          10              FIRST NAME
 1                  1          20              LAST NAME
 1                  1          30              COMPANY NAME
 1                  1          30              STREET ADDRESS
 1                  1          20              CITY
 1                  2           2              STATE
 1                  4           9              ZIP CODE
 1                  1          12              PHONE NUMBER
 4    2    2    0               9999999999     SALES
 3    4    0    0             123199           DATE
 ,                  1           1              STATUS
 2    1    0    0            32767             CUSTOMER
 I    O    D    M                M             D
 Y    U    E    I                A             E
 P    T    C    N                X             S
 E    P    I    I                I             C
      E    M    M                M             R
      T    U    U                U             I
           M    M                M             P
```

FIGURE 1. MASTER FILE FOR PROSPECT.DAT

The first record in PROSPECT.MST gives, in order, the number of fields named minus one (11), the maximum size (25) of the description field, an edit function switch, a clear function switch, and a multiple keyword switch. The edit function permits either redisplay of the entire record after a field has been changed, or a prompt for the next field. The clear function either clears or retains field values from the previous record when a new record is added. Multiple records can be entered for the same keyword by setting the multiple keyword switch.

For each field in a record, the operator enters its characteristics. Field types are inserted in the TYPE column. The MINIMUM and MAXIMUM columns indicate the smallest and largest values a field may contain. Fields are identified in the DESCRIPTION column. The OUTPUT and DECIMAL columns are relevant only to numeric fields. They indicate whether the output formats for the numbers will require a decimal point or not, whether it will be a field with month/day/year form, and how many digits will be to the right of the decimal when used.

After all fields are described, a file documentation report can be obtained. It tells us the record size, the variable names for each field, and the byte location of the initial character in each field. If at a later date, new fields must be added to our records, they would be entered into the master file, and the new documentation report would reflect the variable names and locations of the new fields as well as the new record length.

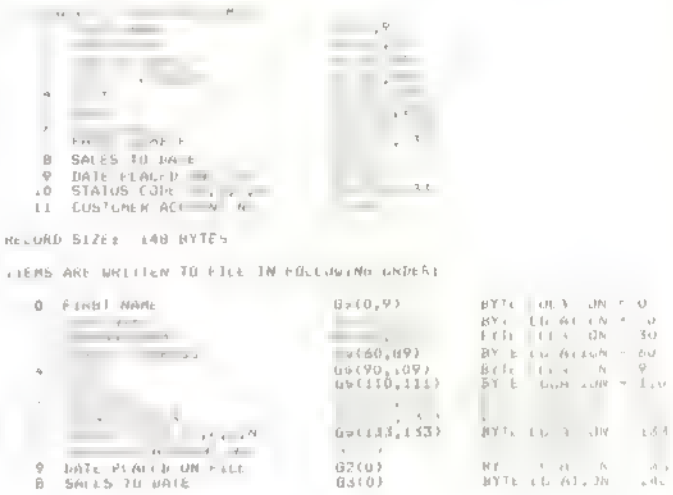



FIGURE 2. FILE DOCUMENTATION REPORT FOR PROSPECT.MST

Once files are created with a consistent file discipline, employing parameters to describe the contents of a file, then every application program can be written to use those parameters when referring to a file. Thereafter, any changes made in the file contents will only change the parameters, and their values are "automatically" tic terms, which occur when one person works with program does not have to be changed every time a file is changed.

A major advantage of consistent discipline in structuring files is that the number of terms a user must learn to effectively create and maintain his files is significantly reduced, as compared to the intricate details of a programming language. That consistency also establishes a clear, unambiguous mode of communication between users and programmers. Using uniform terminology from program to program reduces the problems of cryptic terms, which occurs when one person works with programs written by another. Using proven, reliable software routines eliminates countless errors which prolong debugging. And file management can be learned and used effectively even by persons with a limited degree of computer sophistication, or without an in-depth knowledge of programming.

To sort records in the order we want, it is necessary to create and index. With Jepsan Group K's File management package we would select a Create Indexes command. We would be asked to type the fields we want to sort by, one at a time, in the order of highest priority. If we were working with a set of files for a business with several departments, and a number of sales clerks in each, we might choose to sort our records first by department, and, within each department, by employee number.

Now let us assume that we have instituted a new

bonus scheme for our sales personnel based upon selling a certain number of products and accessories. Two fields must be added for each employee, one for the product tally, and one for accessories. Using a File management package, it is not necessary to have extensive revisions performed upon our software. Instead, in the master file, we would name and describe the characteristics (alphnumeric, numeric, decimal places, and so on) of the new fields we wish to add. Then if we choose to use those new fields in our sorting sequence, we would again select the Create Indexes command, and supply the fields we will sort by in order of priority, including our newly created fields.

After our files are appropriately indexed and sorted, a hard-copy report is usually desirable. File management provides a Reports and Letters command. When we select it, we are requested to indicate the order we want the records sorted. If it's in the same order we created our index, simply depressing the carriage return key will enter that information; else we may type a single field number. A single- or multiple-line heading layout is readily arranged by typing it on the screen exactly as we want it to appear on our report. Number of lines per page and lines in the lower margin can be specified just by entering in the numbers.

Frequently only records meeting specific criteria are relevant. Thus, we are able to constrain items in response to a screen prompt. The constrained items are not required to be indexed fields. Using the standard "greater than", "less than", and "equal" symbols, plus the value we've selected as a limit, only records meeting that criterion will be printed. Combining those symbols with the operators "and" and "or" enables an even more detailed description of the range to be included.

Different kinds of reports need different print formats. Besides permitting the user to specify which fields of information he wants printed and their positioning on the report, file management will store the specifications of that print format for use on future reports. Different formats for your various reports can be retained as long as they are needed, or can be restructured in a matter of minutes, to conform to your new needs.

The letter file feature of file management enables you to create letters using variable names which correspond to the fields in your records. Those variable names, of course, are retrieved from the file documentation report. At the time the letter-writing portion of the program is run, the correct data from your files will be substituted for those variables.

While the information in a file has intrinsic value of its own, its real usefulness develops as it is used in conjunction with one or more other files. In developing file management techniques, it was realized that most of the things done with files involve several common operations: getting records, putting records out to files, searching for given values in random fashion, sequentially reading files, and so on. If our application files are created with a consistent format, why not have a program that creates the routines to do those operations? Such program-generating software is being developed.

Continued on page 33

# Cromemco Overlay Linker

By Professor Egon Zakrajsek, Ph.D.
and Nickolaj Ivancic, M.Sc.

## Introduction

This article introduces the Cromemco Overlay Linker, a program which links relocatable object files produced by Cromemco assembler, FORTRAN, RATFOR, and C into executable programs. It has all of the features of the Link program delivered with the Cromemco assembler and compilers, and it has several very useful features which Link does not have.

The Overlay Linker's most important extra feature is that it can be used to link and run programs which are too large to fit into memory all at once. It can create a map showing the final memory addresses of all global variables and subroutines. It can read user commands from the operating system command line which initiates the program, from its own prompted command lines, from disk files, and from any combination of these three. There are two versions, one for CROMIX systems and one for CDOS. The CROMIX version takes advantage of the CROMIX hierarchical directory structure, unlike the Link program.

The Overlay Linker package includes a relocatable library file manager program which allows the user to construct customized libraries of frequently used routines and to add specialized routines to a Cromemco-supplied library such as the FORTRAN run-time library.

## Description of the Linking Process

During the compilation of a source module a compiler cannot normally supply the final memory addresses of variables, functions, and subroutines defined and referenced in the module. The best it can do is to generate addresses which are relative to the beginning of that module. This module will be relocated to its final position in memory during the linking process, hence the name relocatable module.

The linker program reads relocatable files, loads them into contiguous blocks of memory, and adjusts all relative addresses to the final memory addresses. The linker also has the job of filling in the addresses of global symbols (variables and subroutines defined in one module and marked as accessible from any module) wherever these global symbols have been referenced in the other modules which comprise the program. Finally, the linker must search one or more library files of run-time routines needed by a program but not supplied by the user.

## Description of the Cromemco Overlay Linker

It happens quite often that a program is too big to fit into available memory. The standard solution in this situation is the "call next program" technique which consists of dividing the program into some number of segments small enough to reside in memory and then executing these sequentially by using the Link-to-Program CDOS system call as the final instruction in all segments except the last. This method, although simple, has two serious drawbacks: first, it is not possible to return to the calling segment, and second, communication between the segments can be achieved only via disk files because the newly loaded segment will completely overwrite the calling one. Both those weaknesses are resolved by introducing the mechanism called "overlaying" or "segmentation."

The programmer creates a program for segmenting by writing it so that it can be loaded by the Overlay Linker into a small root overlay and one or more overlays each of which is composed of a number of subroutines and functions. The subroutines are grouped into the overlays according to some criteria chosen by the programmer. The Overlay Linker is then used to construct a multi-level "tree" of overlays in which the overlays at any given level are called by overlays at a lower level and can call overlays at the next higher level. The execution of a segmented program begins when the root overlay is executed. The root will then activate other overlays by calling the OVRLAY subroutine (supplied with the Overlay Linker package). The root overlay will stay in memory during the whole execution of the program, and the other overlays will be loaded into memory at appropriate times during the execution of the program. When an overlay returns control to the lower level overlay which activated it the lower level overlay may then activate another overlay on the same level as the overlay which has just returned. Each overlay on the same level in the tree is loaded into memory starting at the same location.

Routines in an overlay can reference any symbols defined within that overlay and global symbols located in any active lower-level overlay back down to and including the root. Global symbols in the root overlay may be referenced from anywhere. Routines in an overlay cannot reference global symbols which are

defined in an overlay on the same level or in one higher up the tree

The Cromemco Overlay Linker has the following additional features

It can load Cromemco relocatable files which do not include any absolute loading.

It can handle an arbitrary number of common blocks.

It can create an arbitrary number of overlays each of which is written to a separate file.

The Overlay Linker can allocate blank common at the very end of the loading process, which has the following advantages:

Different modules may delcare blank common blocks of different sizes. The largest value is accepted. (This applies only in the overlay that introduced the blank common block. Higher level overlays may not change the size of blank common block.)

Blank common is not written to the absolute file as part of the program. This can result in a considerably smaller file.

**Overlay Linker Commands**

The Overlay Linker program is executed by typing the command "ovrlink", optionally followed by a command line containing a string of Overlay Linker commands. The Overlay Linker will read the commands, execute them, and then request more commands from the console by prompting with the asterisk (*) character. Each command line may contain a number of individual commands separated by commas. A blank or a TAB character may be used to terminate the command string. The rest of the line is then ignored.

Here is a summary of the commands. When the parameter is a file name the default extension is given in parentheses.

| | | |
|---|---|---|
| A=<file name> | (REL) | Add (load) a file |
| B | | Blank Common allocate |
| C | | Map common blocks |
| D=<hex address> | | Set data loading address |
| E | | Map entry points |
| H | | Set local library directory (CROMIX version only) |
| I=<file name> | (DIR) | Use file for commands |
| L=<file name> | (RLB or REL) | Specify global library |
| M=<file name> | (MAP) | Define map file |
| N | | Map module names |
| O=<number> | | Set overlay level |
| P=<hex address> | | Set program loading address |
| Q=<name> | | Name overlay |
| R | | Reset Overlay Linker |
| S=<file name> | (RLB or REL) | Search library file |
| T=<name> | | Define transfer address |
| U | | Map unsatisfied externals |
| W=<file name> | (COM for CDOS, BIN for CROMIX, or OVR) | Write overlay |
| X | | Exit to operating system |

**Examples**

Example 1: Files PROG1.REL and PROG2.REL contain REL modules created by the FORTRAN compiler. Create the absolute module without map generation.

```
A=PROG1,A=PROG2     Load all modules
S=FORLIB            Search FORLIB for unsatisfied externals
W=B:PROG.X          Write absolute module on B: and exit
```

Example 2: Files PROG1.REL, PROG2.REL, and PROG3.REL contain modules that were assembled by ASMB. Create file PROG.COM and map on file PROG.MAP.

```
M=PROG              Request Map
A PROG1,A PROG2
A PROG3
  -ASMLIB           Search for externals
W=PROG,X            Write absolute module and exit
```

Example 3: Create an overlay structure of the form.

```
        OVRL1     OVRL2     OVRL3
B
I
G
P
R
```

In this case the Overlay Linker will be executed with the command line

```
OVRLINK I=BIGPR
```

The file BIGPR.DIR will contain the following lines:

```
M=BIGPR             Map on file BIGPR.MAP
                    Define global library
                    Load zero level overlay
                    Add overlay call module
                    This is root overlay
                    Now build OVRL1
                    Define transfer address
                    Define name
                    Save as B:AAA.OVR
                    Start OVRL2
                    Overlay will start at SUB1
                    Save as B:BBB.OVR
                    Start OVRL3
                    Note different extension
                    Exit
```

The program in the root overlay must contain somewhere in some order the following calls.

```
CALL OVRLAY ('OVRL1      ', 'AAA     OVR', 2)
CALL OVRLAY ('OVRL2      ', 'BBB     OVR', 2)
CALL OVRLAY ('OVRL3      ', 'CCC     XYZ', 2)
```

**The Relocatable Library Manager Program**

A relocatable library manager program, named RELIM, is a part of Cromemco Overlay Linker package.

RELIM is a program which can be used to construct new libraries from existing REL files, add modules to existing libraries, list the contents of library files, and convert ordinary relocatable (REL) files to random-access (RLB) format. The RLB format differs from the REL format in that the names of all globally accessible subroutines are written at the beginning of the file together with the disk address of the module which contains the subroutine. The Overlay Linker then needs only to scan the name list to determine which modules are required. This results in faster loading, especially if there is a large number of overlays written in FORTRAN, for example. The RLB format is not mandatory. The Overlay Linker can search library files of both formats.

In general, the program RELIM is run with com-

mands in a similar way as the Overlay Linker. Commands are of the same form and with the same meaning wherever possible.

Here is a summary of RELIM commands. Where a command has a parameter which is a file name the assumed file name extension is given in parentheses.

| | | |
|---|---|---|
| A=<file name><module list> | (REL) | Add modules from file |
| B=<file name><module list> | (RLB) | Add modules from file |
| E | | Map entry points |
| I=<file name> | (DIR) | Use file for commands |
| M=<file name> | (MAP) | Define map file |
| N | | Map module names |
| R | | Reset RELIM |
| S | | No sorting |
| U | | Map external references |
| V=<file name> | (RLB) | Write out library |
| W=<file name> | (REL) | Write out library |
| X | | Exit to operating system |

Commands A and B can include a module list parameter following the file name. If <module list> is null it implies all modules. If not all modules are desired the <module list> can be written to specify which modules should (and/or which modules should not) be included. In BNF notation the <module list> is as follows.

| | | |
|---|---|---|
| <module list> | ::= | \| [ <set> ] |
| <set> | ::= | <term> \| <set> <term> |
| <term> | ::= | <factor> \| <term> – <factor> |
| <factor> | ::= | <module name> \| <module> .. <module> \| • \| [ <set> ] |
| <module> | ::= | <module name> \| # |

The semantic is as follows. Asterisk (•) denotes all modules, comma means union, minus sign set difference, double period interval, pound sign (#) the first or last module.

The following examples should clarify the use of module lists:

| | |
|---|---|
| A=FILE[•] | All modules, same as A=FILE |
| A=FILE[A,B,C] | Only modules A, B, C |
| A=FILE[A,B,. C] | Module A and all modules from B to C inclusive |
| A=FILE[• –[A,B,C,]] | All modules except A, B, and C |
| A=FILE[• – A – B – C] | The same as before. |
| A=FILE[# X] | All modules from the first to X inclusive |
| A=FILE[X..#] | All modules from X to the last |
| A=FILE[#..#] | All modules. |
| A=FILE[• –[*..X]] | All modules from the module after X to the last module |

As the final example, let us replace modules BLA, BLE, and BLO from the file B:SUBS.REL in the library A:LIB.RLB. The new version should replace the old one. Write the contents of the new file on the file LIB.MAP.

| | |
|---|---|
| M=LIB | Define map |
| B=A:LIB[• – [BLA,BLE,BLO]] | Add all modules except the ones that should be replaced |
| A=B:SUBS[BLA,BLE,BLO] | Add new modules |
| V=A:LIB,X | Write RLB file and exit |



## About the Authors

EGON ZAKRAJSEK is a professor of mathematics and computer science at the Department for Mathematics, University of Ljubljana, Yugoslavia. Apart from being the author of many internationally published papers mainly dealing with problems of numerical analysis and linear algebra of matrices, he has been involved with computers from the very beginning of the computer era (his first computer was an early ZUSE installed at Ljubljana University some 20 years ago.) He is now leading a team of software specialists forming AMS (Agro Marketing Software) which was founded by the Yugoslav Cromemco representative.

NIKOLAJ IVANCIC is a mathematician employed at the University of Zagreb, Civil Engineering Department. Working together with Prof. Zakrajsek for the last ten years, he has been active in the design and development of many software projects ranging from large civil engineering packages to sophisticated data base systems. N. Ivancic founded and still runs the Cromemco department at AgroMarketing, and organized AMS.

# Educational Software

By Thomas B. Wilson

The harsh economic climate of the Western world has focused everyone's attention on industrial and commercial interests rather than on educational needs. The size of the educational market place is growing but not so quickly that computer manufacturers and software engineers consciously ask, what would education want?

Ayr Technical College is fairly representative of many Further Education institutions. As well as courses in Computer Data Processing and Computer Programming, the College provides courses in Accountancy, Business Management, Building, Catering and Hotel Management, Secretarial Studies, Scientific Studies and General Education at various levels. The Computer Unit attempts to provide support and development programs for each of these study areas. The Accountancy student will be interested in Payroll, Accounts Payable and Receivable etc.; the Hotel school will use the Hotel Reservations and Accounts package; the Engineering technician will be introduced to Stock Control

```
 10 Rem  STRING
 20 Rem  AUTHOR I.N.WARD       AYR TECH.
 30 Rem PROGRAM TO ILLUSTRATE HOW A NAME CAN BE INSERTED IN A STRING
 40 Rem    INDEX
 50 Dim A$(50)
 60 Dim B$(20)
 70 Dim C$(20)
 80 Print"ORIGINAL STRING"
 90 Let A$="SMITH A.*SMITH B.*SMITH D.*"
110 Print A$
120 Print
130 S1 Len(A$)
150 S=0
160 Print"NAMES IN THE STRING"
170  For K=0 To S1-1
180  If A$(K,-1)()"*"Then 220
190  Let B$=A$(S,K-1)
200  Print B$
210  S=K+1
220  Next K
230 S=0
240 Print
250 Print"SUPPLY NEW NAME ';
260 Input C$
270 Print C$
280  For K=0 To S1-1
290  If A$(K,-1)()'*"Then 340
300  Let B$=A$(S,K-1)
310  If C$(B$Then 350
330  S=K+1
340  Next K
350 Lenc=Len(C$)
360 Expand A$(S),Lenc+1
370 A$(S,-Lenc)=C$
380 Print
390 Print"NEW STRING"
400 Print A$(-1)
410 End
```

Continued on page 37

# RBTE:

## *Software for Binary Synchronous Protocol*

Cromemco just announced a powerful new Remote Batch Terminal Emulator (RBTE) software package which allows Cromemco System Two, System Three, and Z-2H Hard Disk computers to functionally emulate IBM 3780, 3741, 2980, and 2770 data terminals using the IBM Binary Synchronous (BISYNC) protocol. The RBTE package also allows Cromemco computers to send files to each other or to other computer systems over dial up, leased, or private telephone lines. The use of the BISYNC protocol assures error free transmission and reception of data, even over noisy telephone lines.

Data rates from 1200 to 9600 baud are supported with RBTE. Data may be transferred transparently or nontransparently. Complete and fully automatic conversion of data from ASCII to EBCDIC or vice versa is provided as required.

Determination of which type of terminal RBTE will emulate is made by specifying configuration parameters. The configuration parameters may be manually specified by the RBTE operator or may be edited into a text file. This text file may then be specified in the command line to RBTE and the file will automatically be read when the program is started.

RBTE utilizes Cromemco's IOP board, which provides multiprocessor capability for the S-100 system, and Cromemco's QUADART serial communications interface board which supports Asynchronous, Bisynchronous, and SDLC mode protocols.

A very powerful feature of RBTE is the online diagnostic trace which allows the user to trace the internal commands given to the Communications Manager, which runs in the IOP board and handles all of the primitive I/O functions. The diagnostic trace also traces the status returned from the Communications Manager and the BISYNC data link control characters. This feature virtually eliminates any need for a datascope to verify proper communication performance.

Once RBTE has been initialized and configured, it enters either the unattended or attended mode. No operator interaction is necessary when the unattended mode has been selected. After the telephone connection has been established, RBTE automatically begins a transmit/receive cycle. The file(s) are transmitted one at a time until all file(s) have been sent. After the transmission of each file, RBTE allows one file to be received. If, after a selected amount of time, no file has been received, RBTE will commence transmitting the next queued file (if any). This cycle continues until all specified files have been transmitted and received or until the line is disconnected. Status messages indicating the progress of the communication are displayed in the status window.

If the unattended mode has been selected, each file is manually transmitted. When no file is currently being transmitted, RBTE will be in a file receive mode.

The RBTE software operates under both single-user (Cromemco CDOS) and multi-user (Cromemco CROMIX) operating systems. When operating under Cromemco's sophisticated multi-user, multi-tasking CROMIX operating system, redirected input may be used to automatically control all aspects of RBTE operation. This can provide a totally self controlled communications facility.

An offline diagnostic test is provided with RBTE to verify the correct operation of the IOP, QUADART, modem cables, and the modem itself. All relevant modem lines are tested.

The software is available from Cromemco dealers on either 5" diskette (Model RBTE S) or 8" diskette (Model RBTE L) for $595.

# System One Introduced Continued from first page

One-H has one 5¼" floppy disk drive, and a 5" Winchester technology hard disk drive — all within the compact cabinet. The new disk drive gives the user over five megabytes of high-speed memory, in addition to the 390K of memory on the quad density floppy disk.

### Modular Design

The System One is perhaps the most modern microcomputer in existence. More modular in construction than its big brothers, the Systems Two and Three, it has the same exterior size as the System Zero/DDF.

The modular design takes on more importance when one realizes that it makes an important contribution to the ease of volume manufacturing, as well as post-installation service. Both of these factors are vital aids in low cost of ownership.

### Advanced Cooling

The cooling system incorporates several significant innovations. Three fans, creating unrestricted high volume air flow, are contained within the cabinet. One fan is dedicated to the power supply module, while the other two blow air through the new, wind tunnel-like card cage. The re-designed card cage — the "Blitz Bus" — increases the card-to-card spacing permitting increased air flow between the cards.

### Truly International

Nearly 50% of Cromemco's sales are international, making varying power supplies a major consideration. The System One addresses this area by use of an original, user-selectable, primary circuit tap selector located on the rear panel. The System One can be operated with 110/220 volt, 50/60 Hz power literally at the push of a button. To enhance the versatility in power selection, the two AC line fuses have the same rating for all line voltages. They are mounted in European holders which can optionally accept the 5 x 20mm fuses common in Europe, or the 3AG type used in the United States.

It can be damaging to change tap selection with the power on, so a mechanical interlock which requires removal of the line cord to access the tap selector switches has been built in.

### Subtle Features

The System One and System One-H have different power requirements, therefore use different power supplies. Both power supplies have new service-convenient features such as LED indicator lights for each supply voltage positioned on the PC board. These lights can be viewed through the air flow vents on the side of the cabinet without removing the cover. In addition, the System One-H has a fault indicator which lights when one of the over-voltage circuits is tripped.

While all of the basic features of the System One are contained in the System One-H, the latter has a few special features peculiar to its needs. Winchester-technology drives are sensitive to external magnetic fields, as well as to shock and vibration. These factors led to the development of a different drive mount which encloses the drive in a steel shell, creating a shield against external interference. The drive is supported on special, vibration damping PVC co-polymer bushings to minimize vibration.

### Appreciating The System One-H

Full appreciation of the System One-H can only be gained through experience, and the IACU is anxiously awaiting its opportunity. We hope to receive one as soon as they are released, which should be within the next two months. Since our inception a little more than a year ago, we have been acquiring data in astounding volume. To meet our expectations, the System One-H will have to be something special. Somehow, we think it will succeed.

### Appreciating Thomas Schmidt

A lot of the technical data for this article was supplied by Tom Schmidt, Design Engineering Manager at Cromemco and the Project Engineer for the System One development. His association with Cromemco began in 1975 as a part-time consultant designer. Along with his other accomplishments Tom holds a B.A. degree in Experimental Psychology from San Jose State University. A better appreciation of the System One can be achieved by

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( ) Computer Graphics
( ) Inventory Control
( ) Investments
( ) Home Economics
( ) Medical Research
( ) Process Control
( ) Sports & Games
( ) Other _____

**Describe Your Present System:**
**(use brands and model numbers)**
Computer _____
Memory _____
I/O _____
Disk _____
Terminals _____
Printers _____
Other _____

**List Software Now in Use:**
**(Packages, Special Operating Systems, etc.)**

**What Types of Software Would You Like to know more about?**

**Would you be interested in preparing an article of interest to our members?**

☐ Yes

Subject Matter _____

# CPMSIM, A CP/M Operating System Simulator Continued from first page

And then there is CROMIX, a powerful, multi-user, multi-tasking operating system from Cromemco, patterned directly after Bell Labs Version 7 UNIX operating system. The software engineers at Cromemco have truly produced a remarkable software product and along with it of course, the ability to carry over and use all of Cromemco's software from the CDOS operating system.

Series 2 CDOS and version 2.xx of Digital Research's CP/M have followed separate paths since the early days of CP/M 1.4 and CDOS 1.07. In those days the two operating systems were virtually identical in so far as the ability to use applications software which was written for CP/M, in a CDOS environment. Not so any more. Much of the software such as the newer releases of Micro-Soft's MBASIC, CBASIC-2, and MicroPro's DataStar, and SuperSort, along with most of the accounting software and such which is designed to run with MBasic or CBASIC-2 **is not 100% compatible with Series 2 CDOS.** The problems which arise from the incompatibilities are serious ones (such as data files which get garbage characters written into them and become unusable)

There is such a wealth of software from a variety of very reputable and established software vendors, proven and powerful, useful packages out there, and the differences between the system call conventions of Series 2 CDOS and version 2 CP/M are not so many or so complicated that something could not be done about it. The answer is a simulator, a small program similar in function to the one which Cromemco uses to translate CDOS into CROMIX calls, except in this case what is needed is a translation from CP/M calling conventions to CDOS conventions

The result is CPMSIM. CPMSIM does the task of converting CP/M 2.2 system calls to CDOS 2.36 system calls so that programs designed to run under CP/M, will run under CDOS or CROMIX. The program takes up less than 2K bytes of RAM and is executed by typing CPMSIMX (X is for eXecute) and the name of the program you wish to run.

For example, if you wish to run Datastar, on a CP/M system you might type:

```
A>datastar form1
     ...to execute under CDOS
A.cpmsimx datastar form1
     ...or on a CROMIX system
% cpmsimx datastar form1
```

The important thing is of course that it works, and allows anyone who wants to take advantage of the virtues of Cromemco operating systems on Cromemco equipment to use the simulator along with most of the software from the CP/M environment. There are some limitations of course and these are noted below in the technical description. They apply primarily to very special purpose programs such as utilities from CP/M and programs such as diagnostic software which are both hardware and operating system dependent.

**Technical anotes on the implementation of the CPMSIM Simulator Program:**

CPMSIM is a program which runs under the CDOS operating system or the CDOS-simulator in the CROMIX operating system, which allows use of certain CP/M operating system calls that are not usually a part of CDOS.

The CP/M operating system has three types of system calls which are not compatible with CDOS:

1. System calls which exist in CP/M, do not exist in CDOS, and which have a system call number which is not in conflict with an existing CDOS call.

2. Calls which do not exist in CDOS, but which have call numbers that are in conflict with existing CDOS calls. (There is only one).

3. Calls which have the same meaning and call number in both systems, but which execute in a slightly different fashion.

Category 1. calls:

| Call | Description | Implementation in CPMSIM |
|---|---|---|
| 6 | Direct Console I/O | Fully implemented |
| 28 | Write protect the disk | Implemented as Null function |
| 29 | Get R/O vector | Returns vector = 0 |
| 30 | Set File attributes | Not implemented * |
| 31 | Get Addr (disk parms) | Not implemented * |
| 32 | Get/Set user code | Performs function, does not affect disk directory as in CP/M |
| 33 | Read Random | Fully implemented |
| 34 | Write random | Fully implemented |
| 35 | Compute File Size | Fully implemented |
| 36 | Set random record | Fully implemented |
| 37 | Reset disk function | Not implemented * |
| 38 | Write random Zero Fil | Not implemented * |
| Category 2. calls | | |
| 12 | Return version number | Fully implemented, replaces CDOS call 12. |
| Category 3. calls | | |
| 15 | Open Disk File | These functions use the users Disk I/O buffer (DMA address) in CDOS. CP/M version 2.0 and greater uses **its own internal buffer:** CPMSIM does likewise |
| 16 | Close Disk File | |
| 19 | Delete File | |
| 22 | Make File | |
| 23 | Rename File | |

*these system calls are usually used only in system utilities etc., some will be implemented in future releases

**Installing CPMSIM:**

Given a program which runs under CP/M version 2.0 or greater, (PROGRAM.COM for illustration purposes), enter the following command line:

A.CPMSIMX PROGRAM FILE1.EXT FILE2.EXT

Note: The FILE1.EXT and FILE2.EXT may be present if the program you are running requires arguments on the command line, they may of course be any filename or other options that the program expects.

There is no certainty that the program will run under CDOS or CROMIX when combined with the CPMSIM program. One of several reasons why it may not is that under CDOS there will almost always be less user memory than there would be in the same machine using the CP/M system, another is that not all the calls have been implemented.

One recommended rationale is for use under CROMIX where the restriction of memory size mentioned above

## CPMSIM

does not apply.

For applications with special requirements which use some of the system calls which are not yet implemented, Magic Circle Software will consider adding them or writing a special version.

**About the Author**

I Sales Engineer and Systems Analyst
nters of America. He has had four
h Cromemco systems, and has been
ter Center for the past three. His program
e includes systems written in 16K and 32K
ictured Basic, Ratfor, Fortran, Z80 Assembler, and
ently in C. He has been involved with writing CPMSIM
and a menu generator for CROMIX called MENUT
h allows running a customized group of programs
rom a menu. His full time occupation is in sales with the
it on division of Computer

## SAP-80 Continued from first page

gram for large computers. Professor Wilson was the initial developer of EASE 2 and of the SAP I to SAP IV and TAB series of structural analysis programs as well. He is the co-author of numerous publications on static and dynamic structural analysis, finite element methods and other engineering and mathematical techniques for problem solving with computers. In his work on these other programs, he saw the potential for creating a simpler, more efficient and in some respects even more powerful program and tailoring it to run on micro computer systems as well as on the large computers.

With the availability on large computers of numerous structural analysis programs such as STRESS, STRUDLE, NASTRAN, ANSYS, STARDYN, SAP V, and EASE 2, to mention a few, it was not easy to sell the idea of another program and get its development funded. He therefore decided to develop it on his own, with the microcomputer need as his initial market. Drawing on his knowledge and experience in developing structural analysis programs, he has created SAP-80 as an easy to learn and use program with large computer capabilities and is continually updating it with even greater extensions. SAP-80 will be extensively adopted as a reliable and proven program for structural analysis with broad applications.

We purchased a reliable microcomputer, Cromemco System Three, specifically to acquire the in-house SAP 80 capability and firmly believe that it is the wisest decision we could have made. It is used extensively by our engineers as an efficient, convenient, money saving tool, performing work that we used to do manually or send out to a mainframe computer firm. The System Three is also our terminal to a mainframe computer and does our word processing for reports, and specifications as well. In the near future, we also expect to do our man-hour allocating and cost accounting using an additional console under CROMIX.

A partial list of the present SAP-80 features is as follows:

1. A new free field type of input, efficient for terminal operation.

2. Two and three dimensional frame and truss static and dynamic analysis capabilities.

3. Capabilities for substructuring a structure, with up to 200 joints and 200 members in each substructure.

4. Concentrated loads can be applied at the joints and at any point in the members as well as uniform loads on the members. Internal forces at points along the members can be determined with the joint forces.

5. The total weight of the materials in the structure is automatically outputted; the member masses included in the dynamic analysis and the gravity loading case included as a loading case by including the member weight per unit length as a member property, and the appropriate vertical and horizontal self weight factors included as part of the member loading.

6. Only the data and information pertinent to a particular structure need be entered. Data omitted is taken as 0. Parameters, once entered, will apply to the following member listings until a new one is entered. There are automatic generation features for joint coordinates and nodes in linear and quadrilateral meshes, for member incidences, properties and loadings and for joint loads and masses. The order of input is not critical for most items. All these features make the input easy and fast with much less chance of making errors.

7. Once the input file is created on the screen with an editor, it is stored on a user disc. SAP-80, which is on a separate write protected disc, will ask for the file on the user disc and generate its working and output files on the user disc. The user disc can be retained as a record and used for future reference.

8. A PLOT feature allows you to check the input geometry on the screen or printer.

9. Load cases can be listed separately and/or combined with applicable load factors, all as part of one input.

Future additions to SAP 80 (next version under development) will include:

1. Temperature loading and even

# SAP-80, Structural Analysis Program

simpler input.

2. Plane finite elements for plate bending, shear wall and shell analysis.

3. Solid finite elements for analysis of stresses and deformations in solid objects.

4. P-Delta and limited non linear analysis capabilities.

5. Possible interactive input if program development becomes sufficiently sophisticated to require a large manual for proper documentation.

6. Other features in response to sufficient user requests and feedback

7. Special extensions will probably become available to limited and specialized users under separate specific licenses.

8. The advent, in a few years, of 16 bit and 32 bit microcomputers with 256K RAMs and virtual memory will bring in-house mini and maxicomputer structural capabilities to the small and medium sized offices and SAP 80 will be the already developed affordable program to use.

Professor Wilson is a noted authority in this field and this new SAP-80 program incorporates some of the latest "state of the art" developments by him and others in analysis methods which will eventually find their way into the large computer programs. The latest version of SAP-80 is available, under license, for $1,000. After one year you can maintain your eligibility for support and the latest updates for $50 per month. SAP-80 runs under CP/M, CDOS or any operating system that can emulate these operating systems. It requires 64K of memory and one, but preferably two, 8" disc drives. It is written in FORTRAN IV so it can be compiled into other operating systems if the demand is sufficient.

**About the Author**

Carl B. Hansen, P.E. is an Associate and senior structural engineer with the civil/structural engineering firm of Ewell W. Finley, P.C. of New York City with responsibilities for the design and working drawing production for building, bridge and public works structures. He is also responsible for standardizing the design and production procedures using the latest proven cost effective high technology available, to contribute to the firm's growth.

As part of this growth program, he convinced the company to install an in-house multi-user Cromemco System 3 computer with engineering specification and word processing software. A small part of his time is spent supporting this system by upgrading the hardware and software, personnel familiarization and time sharing terminal operations control.

Mr. Hansen served with the USMC in WW2, has an M.E. degree from Stevens Institute of technology in Hoboken, N.J. and an M.S. in structures from New York University. The use of computers in engineering design and drafting, engineering programming, contract document production systems and microfilm document storage are also his areas of interest and present effort.

# software treasure chest

We are in the process of finalizing negotiations and details on making the P D software announced last issue available to members. It looks as though there are some 50-75 disks that will eventually be distributed, with an average of 18-20 programs or utilities per disk. A partial keyword sampling from three of the diskettes follows. We will be able to send a complete listing (some 30 pages) of a keyword index of all available disks for $6.00 to any member who requests it. You may have it charged to your VISA or MasterCard by using the form below.

ACCOUNTING
  Ledger Type Program
ADDRESS LABELS
  Print Return Address Labels
ADVENTURE
  Adventure A02 Version
AMATEUR
  Moon Location Programs
  Morse Code Practice Program
  Morse Code Receive Program
  Morse Code Transceive Program
  Radio Teletype Transceive Program
  Random Text Generation Program
  Teach Morse Code Program
ASSEMBLER SUBROUTINE
  Multiple File Reads with Wildcard Names
ASTRONOMICAL CALCULATIONS
  Astronomical Calculations
  Moon Location Programs
BASIC
  Change Keywords in BASIC Interpreter
BIT MAP
  Bit Map for Various Formats, Densities
  Print Bit Map
BYTE
  RATFOR Preprocessor
BYTE HANDLING
  Astronomical Calculations
CDOS
  CDOS Comments
  Filter for CDOS Programs on CP/M
CATALOGING
  Diskette File Name Cataloging System
CHAINING
  Math Problem Generator System
COMMENTS
  CDOS Comments
COMMUNICATION
  Memory Buffering to Diablo Hytype
  Modem COmmunications System
  Modem Programs
COMPU-TIME
  COMPU-TIME Real Time Clock Calendar
CONCATENATE
  Concatenate Assembler Source Files & Remove Contents
CONCATENATING
  RATFOR Preprocessor
COPY
  A Faster Track Copy Program
  A Track Copy Program
  Copy Program
CROSS REFERENCE
  Cross Reference Generator of Assembler Code
CURVE FITTING
  FORTRAN Subroutines
CYPHER
  Encode and Decode of Files
DIABLO HYTYPE I DRIVER
  Software Driver for Diablo Printer
DECODE
  Encode and Decode of Files
DELETE FILES
  Interactive Disk Cleanup Utility
DIRECT BIOS CALL
  Diskette Directory Three Across
  Diskette Sector Handler
DISASSEMBLER
  Disassembler Using TDL Mnemonics
  Interactive Disassembler
DISK CONTROLLER
  4FDC Bios and Boot for CP/M
  CBIOS for 8221 Disk Controller
DISKETTE
  Diskette File Name Cataloging System
DOUBLE DENSITY
  Double Density Format and Copy Utility
EPROM
  Program EPROMS with Connects of .COM Files
EDITOR
  Text Editor
ENCODE
  Encode and Decode of Files
EXPENSES
  Ledger Type Program
FAST I/O
  Faster Utility Execution
FILE COMPARISON
  Split Screen Video File Comparison Utility
FILE COPY
  A Faster Track Copy Program
  A Track Copy Program
  Double Density Format & Copy Utility
FILE READS
  Multiple File Reads with Wildcard Names
FORTRAN
  Adventure A02 Version
  FORTRAN Subroutines
  RATFOR Preprocessor
FORTRAN BYTE HANDLING
  Astronomical Calculations
FREE SPACE
  Print Bit Map
FUNCTION PLOTTING
  FORTRAN Subroutines
FUNCTIONS
  RATFOR Preprocessor
GAMES
  A Friendly Game of Computer Chess
  Adventure A02 Version
  Game CRAPS .BAS
  Simulates Electronic TV Game PONG
HARDWARE
  CDOS Comments
HEX FILE
  COM file to HEX Format File Convertor
I/O
  Faster Utility Execution
INCOME
  Ledger Type Program
INDEX
  RATFOR Preprocessor

etc., etc., etc

As noted, the above list is only a sample of how the keyword index is printed. A brief reading shows that there is quite a bit of cross referencing of specific programs or utilities under different subject headings. To receive a complete index, copy the form below and mail to: IACU, P O Box 17658, Irvine, CA 92713.

PLEASE PRINT or TYPE

Name _____ Member No. _____

Address _____

City _____ State _____ Zip _____ Country _____

VISA/MasterCard No. _____ Date Expires _____

Signature _____

# input...

**Free Computers?**

Editor:

I want to take this opportunity to congratulate I/O News for making it through its first year in such fine style. As a CPA, I am well aware that the first year for new enterprises is most often the crucial year. I/O News has, overall, improved with each issue. Keep up the good work, and let me know when you think you will become a monthly publication.

I would also like to address some significant portions of the new tax provisions that could affect many of your U.S. subscribers.

Basically, these new provisions could be entitled, "The Computer Buyer's and Computer Seller's Relief Act of 1981." If you are thinking of buying a computer system (or if you are a dealer), it can be most advantageous to do so now, and take delivery before December 31, 1981.

One new provision, called the Accelerated Cost Recovery System (ACRS), allows for a current year tax break — over and above normal — of 15% of the cost of a computer system (or certain other business assets), as well as a dollar-for-dollar tax credit of 10% of the system's cost.

The Congressional intent of this provision was to give businesses the incentive to upgrade — now! But, you'll have to move fast.

There are also generous incentives for increased Research & Development expenditures in the current year compared with an average of expenditures over prior years.

The upshot of these provisions can be very advantageous to companies, or even individuals, if they act quickly enough to get the benefits within the current tax year. It could almost amount to a free computer in the right circumstances.

My advice is, if you are considering buying a computer, or if you sell computers and have customers who are waiting for interest rates to settle down (or some other such reason), consult your tax-oriented CPA or attorney right away.

Again, congratulations to you and your staff for bringing us "all the news" in I/O News.

R.A. Strathearn, CPA
Newport Beach, California
Member #00008

Thank you for your advice. We elected to pass this information on in print because it is a subject that while not affecting all our members certainly could be beneficial to many of our U.S. members and dealers.

And as you so adroitly noted, it is a subject that belongs in a publication that is designed to deliver all the news affecting its readers.

As to when we will become a monthly publication, don't look for it soon. In fact, we may never become a monthly. Rather, we may just produce issues on a bi-monthly basis, and supplement current news through the implementation of an electronic bulletin board or similar mail device. These things are all being considered for the future — but not the immediate future.

Also, as you noted, the first year is the toughest. We have found it to be a demanding, but enormously rewarding year. One way to measure rewards is through renewals, and almost all of the memberships up for renewal at this time have already come back, with more coming every day.

While we are the ones who get to read the warm notes that accompany many renewals, we know who really make I/O News successful: the people who take the time to contribute the editorial material, sharing their experiences and their computer problems and solutions with other users.

To them, we say thank you. Keep the fine editorial material coming, and I/O News will be able to continue printing all the news.

Richard Kaye
Editor

# bits & bytes, nibbles & tweaks...

**32K Structured BASIC running under CROMIX**
**"Too many files opened for this process" ERROR**

32K Structured BASIC was originally designed to run under the CDOS operating system, and the file opening commands were designed to ensure that file integrity was maintained. If a file was opened for 'Read Only' and was later closed, Structured BASIC would not pass a 'Close' call to CDOS because it was not necessary due to the fact that the file had not been changed.

Under CROMIX, this is not the case. If a file is opened for 'Read Only', CROMIX must receive a 'Close' call or the file will remain open until the process is completed by returning to 'Login.'

If too many files are opened with a 'Read Only' command (Open\1,50,1\file$) eventually the CROMIX error, "Too many files opened for this process" will occur.

If the following Structured BASIC program is run under BASIC, a 'Close' command will pass a system call to CROMIX to close the open file:

```
10  Rem Cromix File Close Fix : CRXFILFX
20  A=Peek(%0CD2%)+256*Peek(%0CD3%)
        +%009B%
30  Print"Address ";A
40  B=Peek(A)
50  If B#200 then Print"Peek Error" : Stop
60  Poke A,0
70  Print 'Completed'
```

If you want this feature to be permanent, then you must save this new Structured BASIC as shown on page 403 of the 32K Structured BASIC manual. If the size of your Structured BASIC is not 140 pages, then refer to the 'Save' command in the CDOS manual.

**South Jersey & Philly Group Update**

The S.J. & P. Users' Group has changed its meetings to the last Wednesday of each month, 7:30 pm, at the Rickshaw Hotel, Rt. 70 South, in Cherry Hill, NJ. Membership in this group is now $15 per year to cover the costs of coffee and refreshments served at the meetings. They feature guest speakers on both hardware and software topics which are of interest to Cromemco users. Several business people who are planning to computerize have been attending and report the meetings are good learning experiences. Guests are welcome.

This group is becoming very active — even to the point of arranging a week-long "meeting" in Hawaii. The trip is April 23 - May 1, and costs a total of $599 for airfare (from Philadelphia) and hotels. At press time, there were only six seats open. Anyone interested in contacting the group can do so at their new "hotline" number: (609) 428-6701.

**NWACU Moves Meetings**

The NorthWest Association of Cromemco Users has outgrown its original meeting place, and is now meeting in a large conference room at a local bank. Members and guests wanting to attend may get information from Jim Illman at (206) 932-7600

**Specialized Software for Science Needed**

Donald A. Fox, Ph.D., Assistant Professor of Toxicology in the Department of Pharmacology at The University of Texas Health Science Center at Houston, sent us the following request:

"Our basic needs center around making measurements on acquired waveforms and processing of entire waveforms. Specific needs will include latency and amplitude measurements, peak to peak measurements, definite integral determinations, slope analysis, rise and decay time analysis, area under the curve analysis, frequency analysis and difference in time and amplitude between locations. I believe that some of these requirements will require the establishment of a dual cursor system so that I can determine the exact points I'd like to analyze.

"As far as processing the entire waveform, the following functions or capabilities will be needed: Differentiation, integration, N point smoothing, data shifting and data rotation.

"I would appreciate any feedback you can provide on these operations."

If you have any such software lying around the garage gathering dust, you might give Don Fox a call at (713) 792-5884. He'd love to hear from you.

**New Cromemco Users' Group Forming**

Interested users in the Eastern Missouri and Central /Southern Illinois area are asked to contact: John A. Knapp, 1308 DeSoto Drive, O'Fallon, IL 62269, (618) 624-2727, if they would like to affiliate with the new group John is forming.

The group is slated to appeal to applications and communications software enthusiasts, and will feature software exchange privileges and a monthly newsletter. Individualized software development and support in various languages will be available to members at a nominal rate. John's position as a technical general manager for a major consulting firm makes him an ideal source for workshops, speakers, and other benefits for the group.

**Robert Gunn Fan Club**

Clinton Pace, M.D., of Loomis, California, sent us a few words of praise for a man who is probably familiar to many of you. Dr. Pace wrote: "Can I put in a plug for Bob Gunn of Houston? His Supercopy program which will copy all floppies in either CDOS or CROMIX is really excellent. I also use his adaptation of WordStar for the 3102 Intelligent Terminal, and it works very well."

Although we've yet to meet Robert Gunn, this note from Dr. Pace reinforces a lot of things we've heard about him.

# bits & bytes, nibbles & tweaks...

**Cromemco, Inc. in Inc.**

Inc. Magazine, a success story itself in the field of publishing, features a story on Cromemco in its November issue. It seems that Cromemco's founders, Dr. Roger Melen, and Dr. Harry Garland, have built the company to its present size in a novel enough way to rate this article. A story worth reading, it starts on page 117.

**Detroit Area Group Demos Software & Devices**

Ford Buckner, Frank Baber, et al, have put together a very active local users' group. At their July meeting, demonstrations consisted of 'Squeeze and Unsqueeze' which is a program for data compression, a TYPE & TALK audio response unit which easily attaches to the TU-ART board serial port, and the chance to review the remote abilities of the CPM network and a modem program for transferring data between sites.

The August and September meetings were equally as active and included formatted screens for data entry over modem lines, a program called 'DISPLAY' which allows forward/backward searches through an ASCII II data set, and a demonstration of Condor Computer's (Ann Arbor, MI) relational data base system.

The group extends an open invitation to any IACU members in their area (Greater Detroit) to attend meetings. Call Ford Buckner at (313) 420-2183 for information.

**SUDS Review**

Several members have called or written to discover which of Cromemco's many software packages could be expected to be revised in the next year. We tried to get a list from Cromemco as to what package was scheduled for when, so that members could join SUDS at an appropriate time.

Instead, we learned that Cromemco's software is constantly in review and update. We also learned that we can plan on each language being revised on the average of once each year.

For example, CROMIX Version 11 was released this September, just about one year after the release of Version 10.09. Also, FORTRAN Version 3.42 started being shipped to FORTRAN SUDS subscribers in October. This latter came as a surprise to us, as we felt that the prior version was pretty solid. However, the new version was not done to correct any massive errors, but to enhance an already good language by increasing the speed of the multiply and subtract variables, as well as the speed of converting integer variables for formatted output. Version 3.42 also contains other enhancements which will be of great value to most FORTRAN users.

The whole point seems to be that if you have a Cromemco software package that you use and rely on, it appears to be only prudent to register that package in the SUDS program.

**CromemCohorts Start Library**

The Los Angeles based users' group, CromemCohorts, has started a library of current programs and utilities written by members.

The group now meets on the first Tuesday of each month. Contact Rich Sloan, 906 Sartori Ave. #4, Torrance, CA 90501, for information.

**Special Characters in COBOL**

William Salmon of Matawan, New Jersey, wrote:

> "I read the COBOL Corner article in the July/August issue with interest. Another method for generating special characters follows. The advantage is that it does not use any procedure division statements for initialization.

```
WORKING-STORAGE SECTION.
    01  SPECIAL-CHARACTERS.
        05  DIGITAL-FORM          PIC 9(4)
            USAGE IS COMP
            VALUE IS 6987
        05  CHARACTER-FORM
            REDEFINES  DIGITAL-FORM
            10 ESCAPE-CHAR     PIC X.
            10 ERASE-TO-EOL    PIC X.
```

> The value for each pair of characters is developed by multiplying the high-order character value by 256, then adding to low-order character value. In the example the erase code (27) times 256 plus the 'erase to end of line' (75) gives a value of 6987."

Thanks, from all COBOL users, for your suggestion.

# output...

Richard Kaye
Editor and Publisher

Since reporting on Richard Quinn's uninsured theft loss (Vol. I, #6), we have had several calls, letters, and conversations on the subject of insurance for computers and computerists. It seems many members are either underinsured, or uninsured.

For example, a great many members have their comuters at home. Typical homeowners' or renters' policies are woefully inadequate in terms of the coverage they provide for computers, peripheral equipment, and software. Further, if the home computer is determined to have a business or professional use, it can face exclusion from coverage under homeowners' policies as a "business asset in the home," or under similar language. To make matters worse, it can cost a great deal to add a specific coverage rider onto a homeowners' policy. We know of one instance (in New Jersey) where a member has a system at home for professional purposes. He contacted his insurance agent and purchased specific coverage for his system. The cost? $700 per year!

Now for the good news. We have been able to establish to the satisfaction of insurance underwriters that the IACU is an association with a sufficient community of interests, and regular two-way communications to qualify all of us (U.S. members only, at present) for Group Insurance Benefits.

As an example, based on rough estimates which will vary depending on how many take advantage of a Group Policy, we have preliminary quotations from a BEST 'A' (an insurance industry rating) insurance carrier. For a system costing $10,000 - $20,000, plus peripheral equipment, plus software, plus software redevelopment costs, members of IACU can purchase a policy for about $150 per year. That is the total quoted premium cost for a system in a home. Remember, at this time these figures are only estimates, but they are such competitive estimates we would like your input to determine the level of your interest. The more who take advantage of this opportunity, the more favorable our premiums will be. So, give us your input on the card provided.

In addition, we extended our insurance research to include medical, life, and disability policies. From our membership lists, we know that a great many of you work out of your homes, or have companies too small to qualify for favorable group insurance. As a case in point, the IACU has only two full-time employees. The monthly cost for health insurance for myself and my family is $155. This is for Blue Cross, and we used the coverage provided in my policy as the basis for evaluating other policies. Again, the savings are quite dramatic. An equivalent (actually better coverage, with a lower deductible) can be obtained through the group buying power of IACU for about $90 per month.

We have not yet done any dollar-for-dollar research on life policies because we know that this has become a very competitive field, and we have been assured we can obtain extremely favorable rates by instituting a group plan.

Please, let us know your levels of interest. Merely complete the enclosed card and mail it back to us. This is for IACU's internal information only, and NO SALESMAN WILL CONTACT YOU. If the results of this survey warrant proceeding, we will report to you in forthcoming issues. Thank you for your assistance.

# COMMERCIAL MEMBERS

Special Memberships are open to authorized Dealers and OEMs only. These memberships cost $350 per year, and entitle the member to a special listing on the Association's Referral Service Data Base, as well as this printed listing.

**ACCOUNTABILITY SYSTEMS**
**3516 E. Chapman Avenue**
**Orange, CA 92669**
**(714) 532-3200**

An exclusive Cromemco dealership, Accountability Systems caters to the growing business and industrial base in Orange County. The store carries a full complement of Cromemco hardware and software, and specializes in excellent and prompt service. Developers of a medical billing package that can be used in small to large offices. The package provides full accounting and billing capabilities including: GL, A/R, A/P, Inventory, producing Patient Billings, Medicare & Medi-Cal Billings and Monthly Statements.

Key Personnel: Michael L. Peterson, Systems Analyst
Kathleen Peterson, Office Mgr.
Bruce Hughes, CPA, Acctg. Consultant

Major Market Area. Sales & Service. Orange County
Extended Market Area Sales & Service· Southern California. Software: Nationwide

**APPLIED RESEARCH, INC.**
**6151 W. Century Blvd., Suite #216**
**Los Angeles, CA 90045**
**(213) 670-0811**

Complete line of Cromemco hardware, plus Tally Printers. Large inventory of Cromemco software on hand at all times. Other applications software in inventory, plus in-house custom programming. Engineering services and complete consulting available.

Key Personnel: S.Y. Wong, Pres.
D. Van Couvering, Mgr., D.P.
R. Lapkin, Tech Staff, Sales
N Vadnais, Tech Staff, Sales

Primary Market Area: Los Angeles Basin
Extended Market Area: Throughout Southern California

**AGRO MARKETING**
**B Adzije 7/1, 41000 Zagreb**
**Yugoslavia**
**41 417-662 Telex: 2141yuam**

Large full-service facility, with complete line of Cromemco products and proprietary software. Specializing in software development, interfacing, and special medical computerized equipment

Key Personnel: T. Raguz, Director (Marketing)
N. Ivancic, Software Manager
B. Krtolica, Customer Support (Hardware)

Major Market Area.
Sales & Service: Internationally, primarily Yugoslavia

**AMERICAN COMPUTER COMMUNICATIONS, INC.**
**433 Airborne Blvd., Suite 310**
**Burlingame, CA 94010**
**(415) 348-1956**

A full-service Cromemco dealership specializing in before or after-sale training — either individual or in classes, ACC offers expertise in configuring CROMIX, Color Graphics, and Plotter Interfaced Systems. Carries Lear Data Software (Tri-Star, Tri-Med, Tri-Dent), dBASE II, WordStar, Spellbinder, FMS-80, - all for Cromemco Systems.

Key Personnel: Taki Oshima, Pres.
Douglas Sherrod, Vice Pres.
Marie Yonge, Programs Mgr./Ofc. Automation
John Gibb, Acct. Exec./Graphics
Bob Agresto, Field Sales/Systems Consultant

Primary Market Area: S.F. Bay Area/Sacramento/Reno
Extended Market Area: Hawaii (Sales, Service & Training)

**AMERICAN COMPUTERS & ENGINEERS, INC.**
**2001 S. Barrington, Suite 204**
**Los Angeles, CA 90025**
**(213) 477-6751**

Consulting engineers, sales and service. Provides on site or in-house service agreements to all Cromemco Users. Offers structural engineering programs, accounting and word processing.

Key Personnel: Ghassan Dib, Pres. (Ph.D. Structural Engineering)
Aziz Al-Khal, Industrial Engineer (Sales & Marketing)
Marwan Dib, Mechanical Engineer, (General Manager)

Major Market Area:
Sales & Service: Stores in Berkeley, Los Angeles, & Newport Beach, California and Paris, France.

**COLLINGSWOOD COMPUTER CENTER**
**1165 Barbara Drive**
**Cherry Hill, NJ 08003**
**(609) 488-1144**

Medium-sized software house, specializing in small business systems; all models of Cromemco/payroll, billing, mass mailer. Provides warranty service also contract and hourly service.

Key Personnel: Jim Lenz, Pres. (Software design & development)
Deborah Lenz, Vice Pres.
Ken Peacock, Service Mgr.

Major Market Area:
Sales: New York to Washington, extending to entire U.S.
Service: Metro Philadelphia extending to Eastern Corridor.

**COMPUTER CENTERS OF AMERICA**

**2129 Westheimer Road**
**Houston, TX 77098**
**(713) 527-8008**

**2629 Stemmons Fw., 215**
**Dallas, TX 75207**
**(214) 638-4477**

Complete line of hardware and software in inventory, 10,000 square feet of space. Provides warranty repair service

Key Personnel: Avery More, Pres. (sales)
Richard Hernlund, Dallas Manager
Ron Blake, Houston Manager

Major Market Area: Sales & Service: Houston and Dallas, Texas

**COMPUTERLAND**
**16 A Avenue Marnix**
**1050 Brussels**
**Belgium**
**2/54.34.45 Telex: 62973**

Computer store, providing warranty repair service. Complete line of Cromemco Equipment

Key Personnel: T. Beyerman, Chairman (software)
J.P. Deville, Technician (hardware)

Major Market Area:
Sales & Service: Internationally, primarily Belgium

**CUSTOM COMPUTER SPECIALISTS, INC.**
**208 Roanoke Avenue**
**Riverhead, NY 11952**
**(516) 369-2199**

Full service systems house with retail showroom. Full line of Cromemco hardware, software, accessories, and literature. Provides warranty service, diagnostics, consultation, systems analysis, and custom programming. Special management software for attorneys, mass transportation scheduling, reservations, delivery manifests, education, small businesses. School rentals, teacher training.

Key Personnel: Gregory G. Galdi, Pres.

Major Market Area: Sales: Northeast U.S., extending to East Coast
Service: East Coast extending to Continental U.S.

**DATAX DE MEXICO SA**
**Saturnino Herran 77**
**Mexico 19, D F.**
**593-22-42**

Computer store, with showroom displaying complete line of Cromemco equipment. Special emphasis on small businesses and in the educational field. Warranty repair service available.

Key Personnel: Ignacio Palomar, Gen. Mgr. (hardware)
Jose H. Espinosa, Program Mgr. (software)

Major Market Area
Sales & Service: Internationally, primarily Mexico

**DATRON MICRO-CENTRE**
**2 Abbydale Road**
**Sheffield, England**
**0742-585490 / Telex: 547-151**

Main importer, sales and support to dealers and direct, Europe wide. Full Cromemco range. Standard software & consultancy for special applications. Experienced in customized hardware and device drivers and provides warranty and duration service.

Key Personnel: Ian Dunkley, Director (sales)
Dave Rotherham, Software Specialist
Alan Deeley, Hardware and Configuration
Paul Waring, Civil Engineer

Major Market Area. United Kingdom, Europe

**DIGIBYTE SYSTEMS CORP.**
**31 East 31st Street**
**New York, NY 10016**
**(212) 889-8130**

**480 Lexington Avenue**
**New York, NY 10017**
**(212) 687-5090**

Complete computer center housing a full line of Cromemco hardware and software. Special services include installation, warranty service, and customer education. Large selection of Cromemco software packages as well as custom programming for business and professional applications.

Key Personnel: Robert Silverman, Pres. (software)
Barry Becker, Vice Pres. (hardware)

Major Market Area: Service — Primarily East Coast.
Sales — Worldwide

**DIGITAL TECHNOLOGY**
**10 North Third**
**Lafayette, IN 47901**
**(317) 423-2548**

3,000 sq. ft. computer showroom, specializing in educational/business systems. Large inventory of Cromemco software. Warranty repair service available.

Key Personnel: Greg Madden, Proprietor (hardware)
Tim Stockman (software)

Major Market Area:
Sales & Service: Indiana, throughout Midwest

**INFORMATIVE SYSTEMS P/L**
**3 Bank Street**
**South Melbourne, Victoria, Australia**
**03-6902284 TWX 30458**

Full rage of Cromemco, retail and wholesale computer store. Provides full sales and service, specializing in education and small business applications

Key Personnel: Dr Simon Rosenbaum, Mng. Dir.
Ian Savicky, Tech Advisor
Norman Rosenbaum, Sales Mgr.
Mark Coulthard, Engineer

Major Market Area: Sales & Service: Throughout Australia

**JEPSAN GROUP K, INCORPORATED**
**4180 44th Street, S.E.**
**Grand Rapids, MI 49508**
**(616) 698-8700**

Jepsan Group K is an exclusive Cromemco dealer located in a professional office environment with two demo rooms and four Cromemco Systems for use by customers. Extensive service facilities for all Cromemco hardware, including expertise in PerSci drive and IMI disk repairs Software consultation and customizing, with specialties in accounting and business applications. Developers of *File Management.*

Key Personnel: Phil Schneider, Pres.
John Nordine, Vice Pres.
Ellen Light, Sales Coordinator
Brian Nielson, Service Mgr.

Major Market Area: Sales and Service: Western Michigan Extended Market Area. Service and Software: U S. and Canada

**LENDAC DATA SYSTEMS, LTD.**
**8 Dawson Street**
**Dublin 2, Ireland**

Suppliers and supporters of the full range of Cromemco Computer Systems and software

Key Personnel: Danny McNally, Director, BSC (Computer Science)
Don Lehane, Director, BSC (Computer Science)

Major Market Area:
Sales & Service: Throughout Ireland

**LEAR DATA CORPORATION**
**3273 Claremont Way, Suite 203**
**Napa, CA 94558**
**(707) 252-7139**

Systems House and full Cromemco dealership in professional, 3,000 square foot office facilities. Separate lab and repair facilities. 24-hour service responses. Provides full warranty service. Drive alignments done in-house.

Key Personnel: Robert Gustafson, Pres.
Dr. Joseph Nelson, Vice Pres.
Doug Sherrod, V.P./Mktg.

Major Market Area: Software - Nationwide
Hardware - Northern Calif

**MCM ENTERPRISES**
**459 Hamilton Ave., No. 304**
**Palo Alto, CA 94304**
**(415) 493-3333**

A full service computer solutions company with consulting, equipment, software, training, and service. MCM carries a full line of Cromemco Systems, Lear Tristar and Serendipity Business Software, and NEC Service Center for Northern California (printers and printing terminals).

Key Personnel: M.C. Merchant, (MSEE) Owner
C. Leighton, Project Manager
G. Nielsen, Service Engineer
S. Evans, (CPA) Bus. Consultant
J. Peckler, (CPA) Bus. Consultant
L. Terry, Acctg. Sys. Consultant
L. Yori, (BSEE) Mgr. Reno Office
M. Nadaire, (MSEE) Mgr. Paris Office

Major Market Area:
Sales: San Francisco Peninsula & Nevada extending internationally.
Service: S.F. Peninsula & Nevada extending into N. California

Reno Office: 1275 Kleppe Lane, No. 14
Sparks, NV 89431
(702) 358-0415

Paris Office: 4 Rue Paul Bert
92150 Suresnes, France
Tel (1) 506 33 03 TLX 610994F

**MICROCENTRE LIMITED**
**30 Dundas Street**
**Edinburgh EH3 6JN Scotland**
**031-556 7354 Telex: 72165 Ref. W582**

Complete line of Cromemco Catalog Items in inventory 8,000 sq. ft. computer warehouse, extensive workshop for testing of equipment. Warranty repair service is available.

Key Personnel: Norman Rouxel, B.SC., Director (Cromemco equipment)
Andrew Smith, B SC , Director (Cromemco equipment)
John Pringle, B.SC., Director (Business)

Major Market Area: Sales & Service: Entire United Kingdom, extending to North Sea Basin/Ireland

**SOPORTE ADMINISTRATIVO COMPUTACIONAL, S.A.**
**15 De Mayo #1111 PTE**
**Monterey, N.L. Mexico**
**43-83-40**

Complete line of Cromemco hardware and software in inventory. Specializing in the educational field. Full service facility, providing technical consulting, as well as warranty repair service.

Key Personnel: Juan Angel Perez, Director (systems)
Jaime Martinez, Customer Support (MSEE)
Gerardo Elizondo, Technical Mgr. (MSEE)

Major Market Area:
Sales & Service: Internationally, primarily Mexico

**SYNERGISTICS INTERNATIONAL LTD.**
**35 Fountain Square Plaza, Box 631**
**Elgin, IL 60120**
**(312) 695-7775**

Computer store and software house, with complete line of Cromemco equipment in inventory. Specializing in sales to small business turnkey systems.

Key Personnel: Jim Knowles, Pres. (Sales)
Gordon Muirhead, Vice Pres. (software)

Major Market Area: Sales: Chicago and suburbs, extending to entire U.S. and the United Kingdom. Service: Chicago and suburbs.

**UCI/THE SYSTEMS STORES**
**ARIZONA**
**4022 E. Broadway, Suite 112**
**Phoenix 85040**
**(602) 255-0700**
**CALIFORNIA (Home Office)**
**2520 Mission College Blvd.**
**Santa Clara 95050**
**(408) 988-1988**
**NEW MEXICO**
**6104 Kircher Blvd., N.E.**
**Albuquerque 87109**
**(505) 345-9981**
**OREGON**
**5687 S.E. International Way, Ste. 1**
**Milwaukie 97222**
**(503) 653-5940**
**WASHINGTON**
**14102 N.E. 21st Street**
**Bellevue 98007**
**(206) 643-7444**
**(206) 643-7444**

UCI/The Systems Stores are full service distributors of Cromemco Systems and peripheral equipment for Business, Science & Industry.

Managers: Albuquerque — Paul Enz
Bellevue — Doug Pomeroy
Milwaukie — Mary Loring
Phoenix — Sam Kershaw
Santa Clara — Don Brittin

# Extending Your Control Continued from page 13

A program generator creates the actual program language code for each file using each selected operation, e.g., get record, put record, get next key. If an operation like 'get record' is used for several files, the program generator will create a routine in code for each file based upon the parameters derived from File management. This structured coding is only possible because of the consistent structure of the files created with a file management scheme. The availability of program-generating software in the future will broadly extend the user's command of his computer system.

Your business is growing, changing, developing. As you analyze the way your computer system supports your business, consider the effort, time, and cost of developing new applications as well as modifying existing ones. If you are limited because your software package cannot be quickly and accurately geared to your precise needs, file management is a favorable prospect. It may well unleash the potential you foresaw when your business was still a dream.

ava ab e from Jepsan Group K
MI 49508 Phone (616)

**About the Author**

Vick Denson has comp eted first year computer science stud es at Grand Valley State Col eges and is employed at Jepsan Group K n Grand Rap ds Michigan By us ng Jepsan s file management system she was able to create modify and cross-reference f es desp te a lack of prev ous m crocomputer experience She owes a debt of gratitude to Mr John Nordine for the concepts presented in th s art cle

# tec·tips Continued from page 5

### EARLY REVISION 64KZ'S AND CROMIX

Early versions of the 64KZ (less than revision J) have some switching problems when used under CROMIX. Roger Knopf of Cromemco informs us that these older revision 64KZ's will work fine provided they are used in the lower half (0-8000H) memory locations. Set the switch on SW1 so that older revision cards reside in lower memory. Switches 7 and 8 will both be off. Then use the revision J memory card for the upper half of those same banks (i.e., 7 and 8 on). Depending on the number of users, switches 2 and 3 on each of the cards will be set for bank selection. Since high memory does most of the bank select switching, the newer card, residing in upper memory, will handle this switching when used with CROMIX. The older memory cards then can reside in non-switching memory.

### Z-2H POWER PLUG PROBLEM

In the last I/O News I recommended removal of the power plug that is mounted on the motherboard of the Z-2H computer and soldering the wires directly to eliminate the heating and high resistance that is present in CROMIX and SDI Graphics systems. Another symptom of this same problem can be seen in the plug that attaches to the 5" Tandon drive power connections. If the plug coming from the computer power supply (red, orange and black wires) and attaching to the back of the drive voltage regulator is discolored you may have a ground fault on the motherboard. I highly recommend this modification be made to all Z 2H's that are more than a single CDOS user system.

### STOP AUTOMATIC FORM FEED IN CROMIX

If you are running a program that automatically handles its own line counting for print formatting there can be a conflict if CROMIX and the program are both sending form feeds to the printer. To stop CROMIX use the MODE command with the following command line — MODE PRT L 1 —. This will set the CROMIX line counter to 1 and stop the automatic form feeds.

### FAST vs. SLOW SEEKS

There has been some confusion as to whether or not a fast or slow seek should be selected when using CDOS.GEN with 5" drives. The slow seek applied to the Wangco or Seiman 5" drives that used a different type of stepping mechanism. Always use fast seeks with the newer double-sided, double-density Tandon drives. This will speed disk accesses.

### PRIORITY INTERRUPT CHAINING

There is some confusion regarding the placement of the priority interrupt cable installation. It is first attached to the 4FDC or 16FDC OUT line. Then the same line is attached to the IN of the first TU-ART and from the first TU-ART OUT to the second, third, etc. TU-ART IN and OUT's. The last card on the line should be the PRI card IN. Do not connect the WDI in hard disk systems to the chain.

### LOCATION OF 64KZ to WDI

In systems using lower revision 64KZ cards (lower than J) be certain that the WDI and 64KZ cards are at opposite ends of the motherboard. The on-board clock on the earlier versions of the 64KZ will interfere with proper operation of the WDI if too close

# the COBOL corner

By Jim Alewel
President of Automated Programming Methods, Inc.

This article covers another "HOW TO" idea you may find helpful. Future articles will explore other problems encountered in the effective use of COBOL and its interfaces with operating systems and a possible solution to these problems. Your comments and ideas are welcomed and we'll pass them along as space permits.

## USING SEGMENTATION EFFECTIVELY

Large COBOL source programs containing in excess of 2000 lines of code usually can be successfully compiled and linked in 64K CDOS systems. Larger programs or those containing very large tables will require segmentation or will need to be split into two or more smaller programs. This requirement becomes obvious with the appearance of the LINKer message "? Out of Memory". This message may not apply to those who have purchased the new OVERLAY LINKER. To those of the operating system, linker and program to be linked won't fit into memory. In any case, the program must be divided into various logical chunks of code or sections in order to either split the program into two or more programs or more simply to segment it. This task is relatively simple if the program was written using structured coding techniques.
that haven't, the message simply means that the size of the operating program must be divided into various logical chunks of code or sections in order to either split the program into two or more programs or more simply to segment it. This task is relatively simple if the program was written using structured coding techniques.

Segmentation is accomplished by dividing the entire PROCEDURE DIVISION into sections. Each section is assigned a number (two digit number maximum — zero assumed if not present). Sections numbered 0 thru 49 belong to the "root" or fixed segment and remain in memory at all times during execution of the program. Each section numbered 50 thru 99 belongs to an "overlay" or independent segment (NO DUPLICATE SECTION NUMBERS ALLOWED). Only one overlay segment is in memory along with the root segment at one time. The program must be organized to make the most efficient use of these facts (e.g. frequently used routines such as I/O routines should be included in the "root" segment whereas "one timers" such as INITIALIZATION, OPEN and CLOSE routines should be in "overlay" segments). Although the overlay process appears to be efficient in its own sense, excessive loading and reloading of segments may degrade performance of the run-time application.

Chapter 10 in the COBOL manual is devoted to segmentation. Restrictions imposed on the use of the GO TO/ALTER statements must be strictly observed. Restrictions on the PERFORM statement must also be adhered to in actuality, but may be logically circumvented, as will be demonstrated. The reason for the restrictions is that all overlay segments load immediately following the root segment and therefore overlay each other. Jump instructions and address modifications must relate to those instructions in memory at the time of execution. An example at this point may help clarify the issue:

Consider a program containing a "root" segment and two "overlay" segments (V01 and V02) with the root segment and overlay segment V01 in memory. Assume the program is executing instructions in the V01 overlay segment when a programmed error condition is encountered. The paragraph to be PERFORMmed, a seldom used error routine, is located in overlay segment V02 which is NOT in memory. It is desired to perform this error routine in overlay segment V02 and then continue with the next instruction in overlay segment V01. The restrictions on the PERFORM statement require the PERFORM statement's range to be wholly contained within the current overlay (V01) or the root segment (which it isn't). This limitation can be overcome by PERFORMming a paragraph in the root segment which in turn performs the desired paragraph in the other overlay segment (V02). The root segment will cause overlay segment V02 to be loaded and the desired paragraph to be performed. Upon conclusion of the error routine, control is returned to the root segment. The root segment should then return control to the next sequential instruction in the overlay segment V01. Unfortunately, the wrong overlay segment (V02) is now in memory (V01 does not reload automatically). This problem can also be solved by PERFORMming a "DUMMY" paragraph upon the return from the error routine back in the root segment. The "DUMMY" paragraph is physically located in overlay segment V01 and contains only a paragraph header. The root segment will cause overlay segment V01 to reload and

then return control to the next sequential instruction in overlay segment V01 as desired.

The code look like this:

```
PROCEDURE DIVISION.
ROOT SECTION.
PARAGRAPH-IN-ROOT.
      PERFORM PARAGRAPH IN-V01.


ERROR-ROUTINE.
      PERFORM ERROR-ROUTINE-IN-V02.
        (loads overlay V02)
      PERFORM DUMMY-PARAGRAPH-IN-V01.
        (reloads overlay V01)
OTHER-PARAGRAPH IN-ROOT.


OVERLAY-V01 SECTION 50.
DUMMY-PARAGRAPH-IN-V01.
      (null paragraph containing no code)
PARAGRAPH-IN-V01.


        IF ERROR-CONDITION-FOUND.
          PERFORM ERROR-ROUTINE.


OVERLAY-V02 SECTION 51.
ERROR ROUTINE-IN-V02.


OTHER-PARAGRAPH-IN-V02.
```

**OTHER TIPS ON SEGMENTATION**

1. Duplicate segment-numbers are permitted only in the "root" sections of the COBOL source code and must be contiguous.
2. When LINKing programs containing overlay sections, the PROGRAM-ID must be the same as the SAVED (COM) file name. The LINKer assigns overlays a filename equal to the PROGRAM-ID name
3. Overlays are written to the same drive that the LINKer resides on and must be XFERed to the drive that will be the current drive during program execution. Overlay segments are loaded by a link sub-routine contained in the program (not the CDOS loader). This subroutine will not default to search Drive A and therefore overlays must reside on the current drive. (COM files may reside on either the current drive or Drive A.)
4. Literals coded in an overlay remain in the overlay (unless the /d option is specified during LINKing). Error and other messages used in DISPLAY statements should be included in the overlay as literals rather than data-names in the DATA DIVISION to reduce the size of the "root" segment when necessary.
5. In order for a segmented program to fit into memory during a LINK, the size of the operating system (CDOS) plus the size of the LINKer plus the size of the "root" segment plus the size of the largest overlay plus 256 bytes must be less than 64K. LINKing with a smaller operating system (minimum I/O drivers, no function keys, etc.) may increase available memory enough to allow LINKing to complete. LINKing under CROMIX where more user memory is available will also create a usable CDOS executable program.

**About the Author**

J M ALEWEL is co-founder and president of Automated Programming Methods, Inc of Irvine, California a software development company specializing in programmer productivity aids His 17 years of professional EDP experience has included Programming Systems and Management positions for two large NYSE corporations He was awarded a CDP in 1968 from DPMA and received his BS in Computer Science from West Coast University in 1978 He also developed the curriculum for COBOL and taught it and other computer science courses at Mount San Antonio College for over 5 years

Send your COBOL questions or comments to:

**THE COBOL CORNER**
c/o I/O News

## Educational Software Continued from page 17

and Inventory Techniques, while General Education students may be pursuing a Geography project using some of the specially designed packages available.

Many an industrial firm has diversified to such an extent that its computer needs encompass just as many areas as this College's needs. However, in general, a Computer Data Processing department of an industrial concern with a wide economic base shares the benefits of that economic base. But an educational institution cannot turn to cost benefit analysis to justify its many intangible benefits.

How then can a college provide for its student population and, at the same time, offer administrative tools such as Room Allocation routines and Student Record access? A judicious use of inhouse development and commercially-available packages is generally the answer. Fortunately, in Scotland for some years now a national group, the Scottish Computer Education Group (S.C.E.G.) has coordinated many of the inhouse development programs to make them widely available. One day (or so educationists dream) commercial packages will be available at much reduced prices where the use is for student demonstration only!

Certainly the relatively painless purchasing of Cromemco CS-3's has helped many a college turn from outmoded batch processing computers and expensive time-sharing facilities. In many cases a quantum leap forward has been taken, latent needs identified and a much more efficient service provided to a teaching staff. For the student the benefits have been enormous.

The programming student has freely available to him a selection of high level languages — BASIC, FORTRAN, COBOL...The multi-user facility in itself is a great boon. Operating under CDOS it unfortunately is more limited for COBOL users. What a pity!

Perhaps I/O News will keep all informed of software exchange arrangements with even one eye on the educational user!

Until then, may I offer a few sample programs which, while of somewhat limited practical value, prove to be fine as teaching tools. It is hoped these offerings will encourage others to submit their educational programs to I/O News.

**About the Author**

Tom Wilson is presently Head of Department of Mathematics, Science and Computing at Ayr Technical College. He has served for the last seven years on government advisory committees in mathematics and over many years on various local and national bodies concerned with Computer Eduction.

He is an Honors graduate B.Sc. in Mathematics of Glasgow University and a member of the British Computer Society. His early introduction to computing was as an undergraduate studying numerical analysis. He now directs a wide range of courses in Computer Data Processing and Programming.

**A Mechanical Engineering Program on Space Frames**

```
 10 Rem SPACE FRAME SOLUTION - HUGH CAMPBELL
 24 Dim F(2),A(3,3),Q(3),B(3),L(3)
 25 Common
 26 Dim Q$(3)
 55 *Start
 60 Let F(0)=F(0)+1
 70 If F(0)<1 Then 1070
 72 If F(0)=2 Then Goto Part2
 90 *Part1
500 Def Fna(X)=Int(X*100+0.5)/100
505 Print"SPACE FRAME SOLUTION - PROFORMA HUS001."
510 @
520 @"ASSUME APEX AS ORIGIN O, MEMBERS OA,OB,OC IN METRE."
530 @"THE ORDINATES OF A,B,C ARE TAKEN WRT THE +VE DIRECTIONS"
540 @"OF THE X,Y,Z AXES, AS ARE THE LOAD DIRECTIONS."

550 @
560 @"TENSILE LOADS ARE +VE, COMPRESSIVE -VE, IN KILONEWTON."
570 @
580 @"TYPE IN THE X ORDINATES OF A,B,C: ";
590 Input A(1,1),A(1,2),A(1,3)
600 @"TYPE IN THE Y ORDINATES OF A,B,C: ";
610 Input A(2,1),A(2,2),A(2,3)
620 @"TYPE IN THE Z ORDINATES OF A,B,C: ";
630 Input A(3,1),A(3,2),A(3,3)
640 @"TYPE IN THE LOADS IN THE X,Y,Z DIRECTIONS: ";
650 Input B(1),B(2),B(3)
660 @
670 L(1)=(A(1,1)**2+A(2,1)**2+A(3,1)**2)**0.5
680 L(2)=(A(1,2)**2+A(2,2)**2+A(3,2)**2)**0.5
690 L(3)=(A(1,3)**2+A(2,3)**2+A(3,3)**2)**0.5
700 @"DO YOU WANT A PRINTOUT OF MEMBER LENGTHS?"
710 @"  TYPE YES OR NO ";
720 Input Q$
730 If Q$="NO"Then 900
735 Print Chr$(26)
740 @
750 @
760 @"ORDINATES OF A, B AND C"
770 @" ","A","B","C"
775 @"               X",A(1,1),A(1,2),A(1,3)
780 @"               Y",A(1,2),A(2,2),A(3,2)
790 @"               Z",A(3,1),A(3,2),A(3,3)
800 @
810 @"LOADS"
820 @"X","Y","Z"
830 @B(1),B(2),B(3)
840 ■
860 @"THE LENGTH OF OA = ";Fna(L(1));" METRE."
870 @"THE LENGTH OF OB = ";Fna(L(2));" METRE."
880 @"THE LENGTH OF OC = ";Fna(L(3));" METRE."
890 @
900 Print
910 Rem FIND Q THE SOLUTION OF THE MATRIX EQUATION A*Q=B
920 F(1)=1 : F(2)=1 : Rem FLAGS REQUIRED BY THE ROUTINE FINDQ
930 Run"FINDQ"
940 Rem Q IS THE SOLUTION OF THE MATRIX EQUATION  A.Q=B
950 *Part2
960 T1=-Fna(Q(1))
```

# *NEED SUPERFAST DISKETTE COPIES ?*
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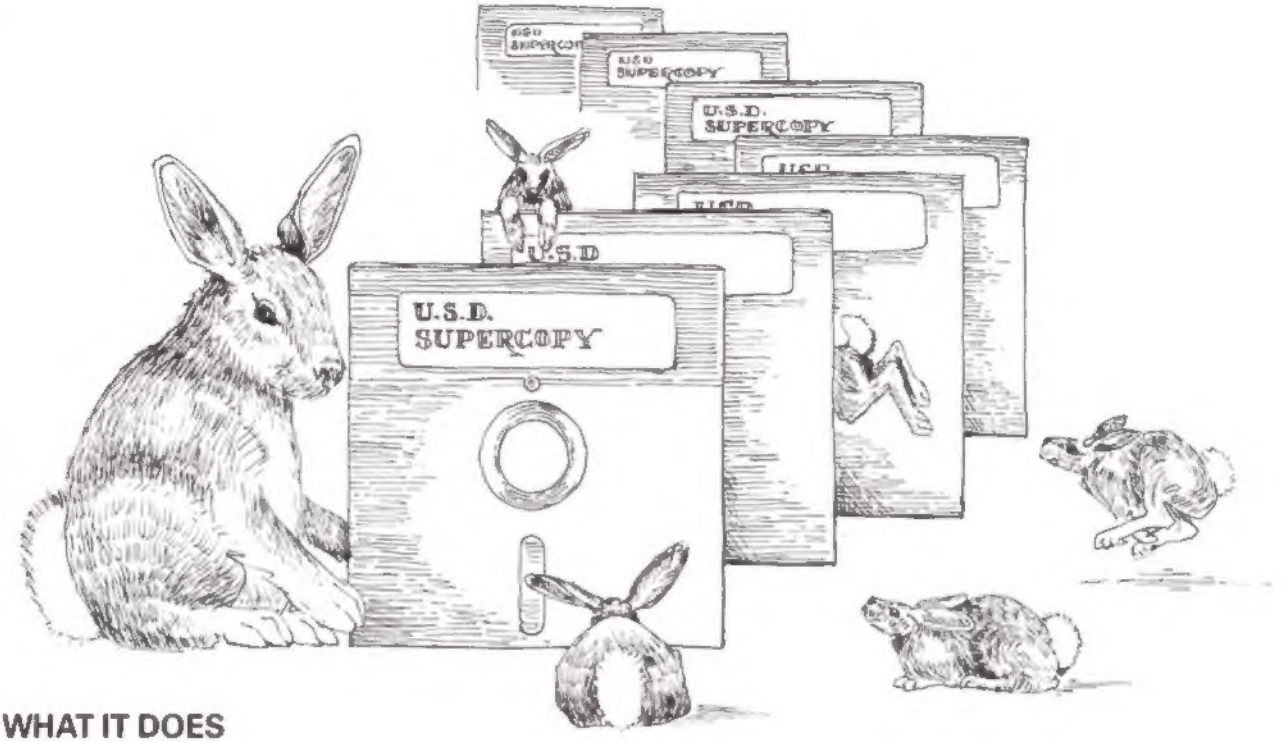
USD offers two FAST copy utilities, SUPERCOPY I & SUPERCOPY II. Either version produces fully-verified, error-free diskette duplicates with amazing speed—less than 140 seconds for an 8" DSDD 1.2 megabyte diskette.




## WHAT IT DOES

### SUPERCOPY I

Supercopy I copies any Cromemco diskette while operating under Cdos, including CROMIX diskettes. Provides readout of errors and their locations, should they occur. Many options.

### SUPERCOPY II

Copies and/or Initializes any Cromemco diskette while operating under Cromemco Cdos OR Cromix. Uses extensive automatic error handling techniques to produce error-free copies with or without operator intervention. Many options are available, all of which may be customized during initial use for future automatic operation. The ultimate diskette duplication utility for both Cdos and Cromix. Allows duplication of previously "uncopyable" diskettes.

## WHAT YOU GET

Supercopy I or Supercopy II on 5 or 8 inch SSSD diskette, comprehensive Users Guide, one year's free software support.

## SYSTEM REQUIREMENTS

Cromemco computer operating under Cromemco Cromix or Series 2 Cdos.

### WHAT IT COSTS

SUPERCOPY I — $49.50
SUPERCOPY II — $95.00
New York residents add 7% — C.O.D. add 10%
Make checks payable to U.S. Dynamics Corp.

30 YEARS AT THE USD LEADING EDGE

### HOW TO ORDER

Call collect or write. If calling, place calls during normal business hours, EST. Ask for software sales.
We accept Visa and MasterCharge

For INFORMATION or SUPPORT: Call collect. Ask for software engineering.

**U.S. DYNAMICS CORPORATION** 425 BAYVIEW AVE., AMITYVILLE, NEW YORK 11701 (516) 842-5600

New Cromemco System One shown with our high-capability terminal and printer.

# A new small computer that won't limit you tomorrow

Here's a low-priced computer that won't run out of memory capacity or expandability halfway through your project.

Typically, computer usage tends to grow, requiring more capability, more memory, more storage. Without a lot of capability and expandability, your computer can be obsolete from the start.

The new System One is a real building-block machine. It has capability and expandability by the carload.

Look at these features:

- **Z80-A processor**
- **64K of RAM**
- **780K of disk storage**
- **CRT and printer interfaces**
- **Eight S-100 card slots, allowing expansion with**
  - **— color graphics**
  - **— additional memory**
  - **— additional interfaces for telecommunications, data acquisition, etc.**
- **Small size**

## GENEROUS DISK STORAGE

The 780K of disk storage in the System One Model CS-1 is much greater than what is typically available in small computers. But here, too, you have a choice since a second version, Model CS-1H, has a 5'' Winchester drive that gives you **5 megabytes** of disk storage.

## MULTI-USER, MULTI-TASKING CAPABILITY

Believe it or not, this new computer even offers multi-user capability when used with our advanced CROMIX* operating system option. Not only does this outstanding O/S support multiple users on this computer but does so with powerful features like multiple directories, file protection and record level lock. CROMIX lets you run multiple jobs as well.

In addition to our highly-acclaimed CROMIX, there is our CDOS*. This is an enhanced CP/M† type system designed for single-user applications. CP/M and a wealth of CP/M-compatible software are also available for the new System One through third-party vendors.

## COLOR GRAPHICS/WORD PROCESSING

This small computer even gives you the option of outstanding high-resolution color graphics with our Model SDI interface and two-port RAM cards.

Then there's our tremendously wide range of Cromemco software including packages for word processing, business, and much more, all usable with the new System One.

## ANTI-OBSOLESCENCE/LOW-PRICED

As you can see, the new One offers you a lot of performance. It's obviously designed with anti-obsolescence in mind.

What's more, it's priced at only $3,995. That's considerably less than many machines with much less capability. And it's not that much more than many machines that have little or nothing in the way of expandability.

Physically, the One is small — 7'' high. And it's all-metal in construction. It's only 14⅛'' wide, ideal for desk top use. A rack mount option is also available.

## CONTACT YOUR REP NOW

Get all the details on this important building-block computer. Get in touch with your Cromemco rep now. He'll show you how the new System One can grow with your task.

*CROMIX and CDOS are trademarks of Cromemco Inc.
†CP/M is a trademark of Digital Research

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